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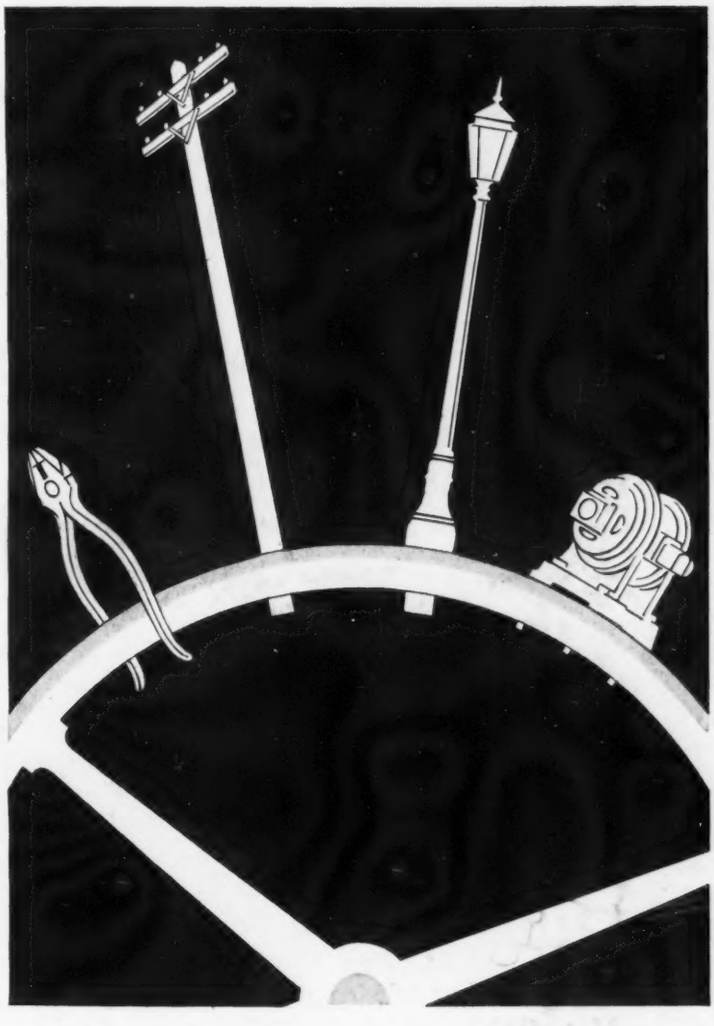
ELECTRICAL WORLD



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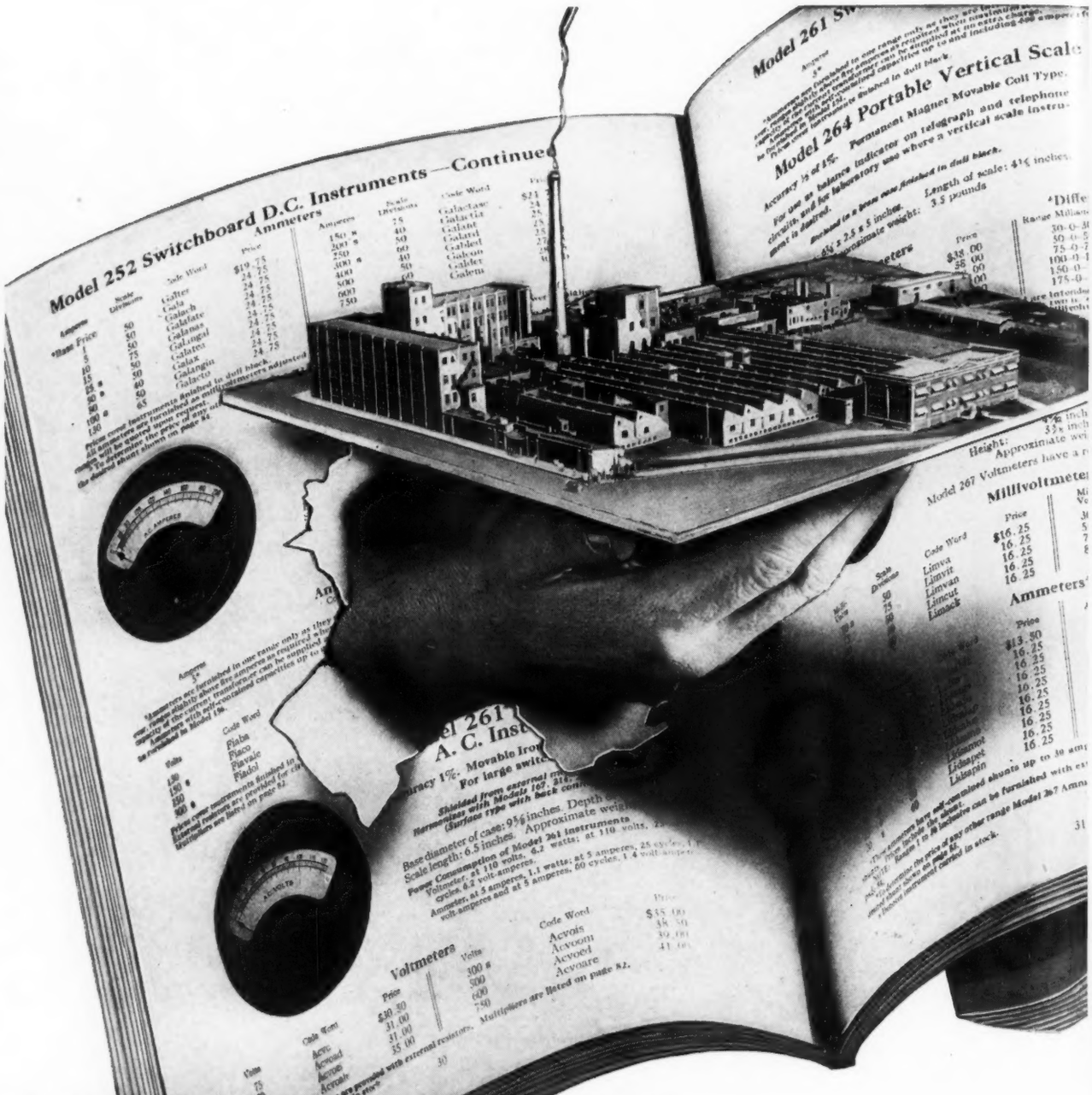

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January 25, 1930

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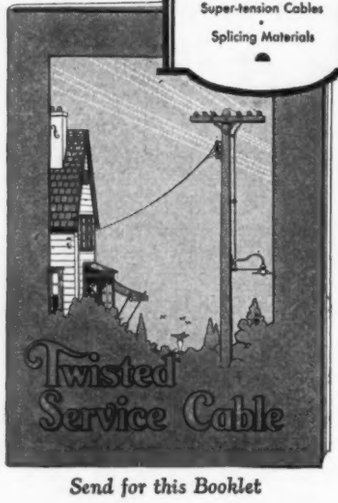

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ELECTRICAL WORLD

for the Week Ending

January 25, 1930

Comment On the News

PATENT POOLS IN RADIO are a center of interest at Washington. Senator Brookhart advocates giving the patents to the government. Senator Couzens says patent rights should be fought out in the courts. Wise counsel is for the radio industry to have the courage to solve its own patent problems.

TRADE STATISTICS are needed by electrical manufacturers in the opinion of Clarence L. Collens, president of the National Electrical Manufacturers' Association. The automotive and steel industries have proved their value. They make possible gages for production and sales schedules that prevent business booms and slumps.

FIDDLES AND MULES were not so very long ago outstanding family possessions in the ancient and honorable Ozark territory of Missouri. Phonographs and "flivvers" have largely superseded them. Soon, if all the hydro-electric projects on the Osage, the White, the Current and the other streams that flow through the hills are carried out, will come the factory and the marts of trade. Seven hundred thousand horsepower is envisioned. Picturesqueness will suffer, and perhaps individuality, but human progress and comfort will be served. That is the time-honored way of things.

PARALLEL OPERATION of utility systems between New Orleans and Kansas City confirms the experiments that have been made elsewhere. A thousand towns were in parallel for eight hours without interruptions. Experimental success, however, does not obviate the need of system operators all over the country getting together and exchanging ideas on handling the problems of continued parallel operation.

FINAL HEARINGS on the publicity phase of the Federal Trade Commission's utility investigation were a little acrimonious, the utilities' counsel making it clear that he did not think the rulings on what should go into the official record were fair to his clients. Implied charges of bias were, on the other hand, resented by the chairman and the commission's own counsel. What is sauce for the goose should be sauce for the gander, says the old proverb—but it says nothing about the goat.

NEWS OF THE WEEK

Utilities Rebuttal Ends, Following the Exclusion of 96 Documents

AFTER seven days of presentation of evidence before the Federal Trade Commission, the public utility associations' side of the case came to an abrupt close on January 18, when a volume of 96 documents offered was excluded from the record by a ruling of Commissioner Edgar A. McCulloch, who presided. This documentary evidence, according to Bernard F. Weadock, special counsel for the utilities, was offered on the ground that no fair appraisal of utility publicity could be made without an understanding of its necessity in combating the misrepresentations and other activities of individuals and organizations whose announced purpose has been to socialize the electric utilities as an opening wedge in a larger campaign directed against all private enterprise.

Commissioner McCulloch said he based his ruling excluding the evidence on the provision of the Senate resolution directing the commission's inquiry. He was willing to concede that individuals and organizations had engaged in activity in behalf of government and municipal ownership, but the inquiry was restricted, he said, merely to what had been done in that regard by utilities.

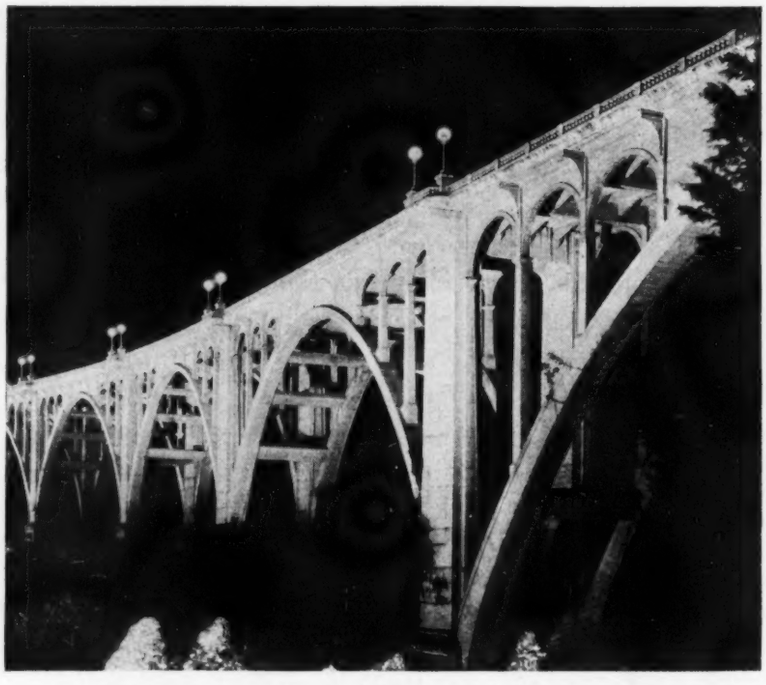
The argument between Mr. Weadock and the commissioner became somewhat heated, the utilities' attorney contending that the commission had no means of reaching a fair and adequate conclusion unless the entire circumstances surrounding the defensive publicity of the utilities were made clear. Later the commissioner admitted the listing of 94 of the exhibits, but declined to admit the documents themselves. Mr. Weadock, in taking an exception, remarked: "Of course, we have no method of appeal from your honor's decision, but it seems to me it is a most positively unique situation here, for we have given you everything we have had for two years."

Organizations named by Mr. Weadock were the League for Industrial Democracy, the National Popular Government League, the People's Legislative Service and the Public Ownership League of America. Commissioner McCulloch said that in several instances, and notably when Preston S. Arkwright, the only witness for the utilities, had been on the stand, he had permitted to go into the record as facts statements to the effect that utility companies had not initiated the public ownership controversy, the other side having initiated it by circulating propaganda in favor of government or municipal ownership. He thought that was the proper limitation of testimony on the point; otherwise, the inquiry might become interminable.

At a hearing on January 16 P. S. Arkwright, chairman of the National Electric Light Association's public relations committee, continuing his testimony, contended that until the recent sessions there had been no opportunity for presentation of the association's position, nor had it had any opportunity for statement of its views. He said that all of the material taken by the commission's investigators had been presented for inclusion in the record, but that some of that having a bearing on the case was not selected.

Commissioner McCulloch retorted that he would not allow the statement of the witness to remain unchallenged. Robert E. Healy, chief counsel of the commission, said that very few of the commission's investigators had been witnesses, the great majority being representatives or employees of the utilities.

Commissioner McCulloch set February 4 as the date for resuming the hearing, on which date an inquiry into the financial organization of the power industries will be started.



FLOODLIGHTING A BRIDGE AT PASADENA

Nothing lends itself better to floodlighting than a beautiful and well-situated bridge. Above is shown the Colorado Street structure spanning the Arroyo Seco in Pasadena, Calif.

"Lexington" Finishes Job; Rain and Snow Take It Over

WITH the expiration of the stipulated 30 days' service to the drought-smitten municipal light and power system of Tacoma, Wash., the navy airplane carrier *Lexington* disconnected late on January 17 the lines which had tied one of her generators to the city lines. The boat had then supplied 4,251,160 kw.-hr. to the city, for which the government will receive $71,511. In addition to this sum the city must pay $18,000 wharfage and incidental expenses, which will bring the total cost close to $100,000.

Rain and snow brought relief to the city's hydro-electric plants as the *Lexington* worked.

▼

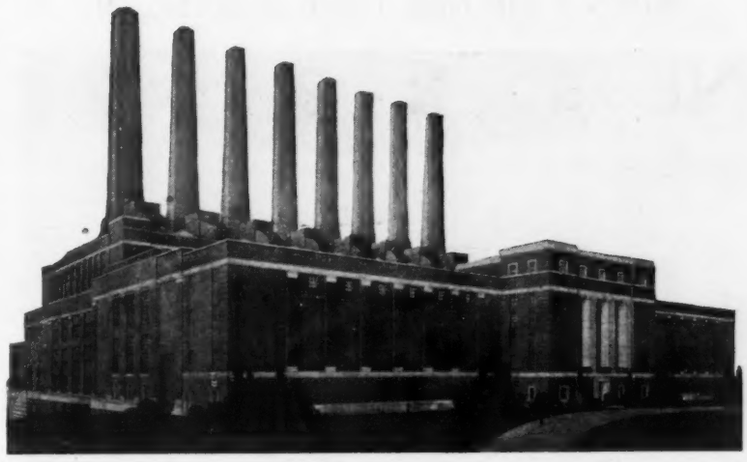
Passing of Preferred Dividend Brings Suit

PASSING of the dividend on the 7 per cent preferred stock of the Florida Public Service Company has been answered by suit for an accounting and receivership on the part of representatives of certain shareholders. A protective committee has been constituted to look after the interests of the holders of the stock in question.

The Florida Public Service Company is a subsidiary of the General Gas & Electric Company, which was acquired recently by the Associated Gas & Electric system. Operating revenue of the company for the years ended September 30, 1928, and September 30, 1929, respectively amounted to $2,035,693 and $2,221,482. The balance after dividends in 1928 was $200,710. In 1929 a depreciation reserve of $112,198 was deducted, leaving the balance $10,929 in the red. It was held by the directors that earnings did not warrant the payment of a dividend, despite the fact that an increase was shown in operating revenue in 1929.

Plaintiff in the suit instituted contends that since earnings of the company were the largest on record, the passing of the dividend was unwarranted. It is argued that the showing of a loss for the year was a matter of bookkeeping.

The question of what should be considered an adequate depreciation allowance for a specific property or group of properties depends on a variety of factors, such as whether generation is by hydro power or by steam, whether there are extensive transmission lines, and so forth. The average allowance is somewhere between 4 and 7 per cent of gross earnings. In this case the amount set aside for depreciation is more than 5 per cent of gross.



The Associated Gas & Electric Company recently proposed to holders of Florida Public Service 7 per cent preferred stock that they exchange their holdings for securities of the parent company. It is understood that substantially more than half of the outstanding stock was exchanged.

▼

P. G. & E. Rates Lower by About $2,400,000

GAS and electric consumers of the Pacific Gas & Electric Company are expected to benefit to the extent of approximately $8,400,000 a year as the result of orders just issued by the California Railroad Commission reducing rates of that company. Reduced electric rates, expected to result in savings to consumers during the year 1930 to the amount of $2,392,710, will be effective on all meter readings taken on and after March 1, 1930. They are the result of proceedings instituted by the commission on its own motion and are in effect interim rates, to continue in effect until future action is taken. They are expected to result in a return to the company of approximately 7½ per cent upon its rate base during the period over which they are expected to prevail, as against 8.48 per cent, the present rate as estimated by the commission.

The decision contemplates the following reductions:

Service	Amount of Reduction	Per Cent Reduction
Street lighting	$35,000	2.06
General lighting, L schedules	1,425,800	7.95
General lighting, cooking and heating, D schedules	68,200	3.51
General power	295,600	4.59
Agricultural power	101,400	2.72
Wholesale power	120,100	3.47
Interdepartment	20,000	....
Incidental lighting	50,000	....
Total (1929)	$2,116,100	5.01
Plus 10 per cent growth	211,610	
L to D customers	65,000	
Total (1930)	$2,392,710	

How Ashtabula Is Being Revolutionized Electrically

WITH the purchase by the Cleveland Electric Illuminating Company of the Ashtabula municipal plant there has come a series of power developments in both that city and the county containing it. The company is erecting a 400,000-kw. steam-electric generating station, of which the architect's plan is shown above, on a site on the lake front, just east of the city. The initial installation will have a rating of 150,000 kw., and the first unit will go into operation about next September.

The existing Ashtabula power plant has been connected with the company's Avon and Lake Shore plants, which have about 600,000-hp. capacity.

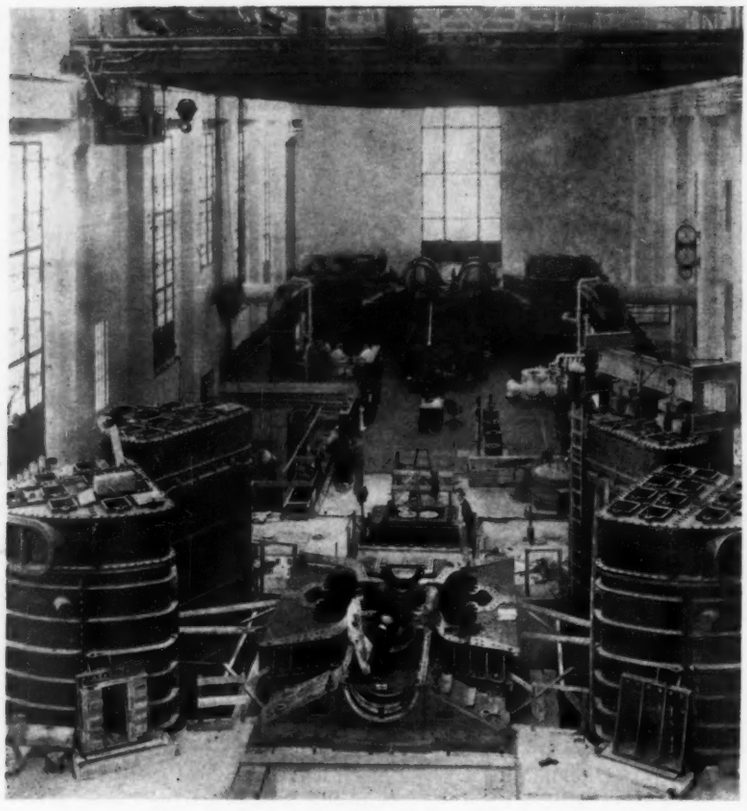
Many other improvements have been made, including the virtual rebuilding of the distribution system, the expansion of the Sanborn substation in Saybrook and acquirement of a transmission right-of-way, betterment of street lighting and building 60 miles of rural line. From 42 employees the personnel has jumped to 225.

▼

N.E.M.A. Gets Encouraging Predictions for 1930

BUSINESS and industrial revival is already under way, and 1930 should be a moderately progressive year, speakers told the midwinter meeting of the National Electrical Manufacturers' Association, held in New York this week. These opinions were expressed by Clarence L. Collens, president of the association, and Virgil Jordan, economist of the *Business Week*, at a general session held at the Westinghouse Lighting Institute January 21. The urgent need for co-operative application of cost accounting to industry was stressed at the same session by

WHEN A BIG NEW UNIT IS GOING IN



The second 100,000-kw. unit of the Southern California Edison Company at Long Beach steam plant No. 3 is scheduled for operation in March. Eventually there will be eight of them.

Thomas W. Howard, the association's newly appointed director of uniform cost accounting.

In the electrical industry, said Mr. Collens, normal steady progress is anticipated, and the year should be about halfway between the levels of 1928 and 1929. The recent recession would have occurred, he said, regardless of the sudden deflation of the stock market, and that deflation should have little effect on 1930 business as a whole. There is no indication, he thought, that projects involving electrical apparatus and supplies will be held up; on the contrary, there is evidence of some stimulation in such projects. He stressed the need for adequate trade statistics.

Business conditions are far better than they were in any previous depression since the war, and it is fairly certain that the present recession will not go further, Mr. Jordan declared in his address. Current indications are that a revival will come more quickly than has been expected. It will be quite vigorous, but will not reach boom level, at least until 1932. Mr. Jordan characterized the present recession as principally a reaction to excessive expansion in the automobile and steel industries during the first half of 1929. He maintained that the effects of the stock market depression have virtually been overcome.

Mr. Howard's address is summarized on page 223.

Meetings of a score of the association sections, including particularly those devoted to electrical supplies, were held, as well as numerous other group and committee meetings.

▼

Poland Studies Harriman Electrification Plan

PRESS dispatches say that the offer of Harriman & Company of New York to electrify a large section of southwestern Poland has been violently attacked in Polish newspapers, and the recent Cabinet, yielding to public opinion, withheld its signature when everything seemed ready for a final agreement.

On Wednesday Professor Matakiewicz, Minister of Public Works, declared in the Sejm that the plans had not yet taken definite shape and were still being discussed by the departments concerned. He therefore was unable to make any definite statements, he said.

▼

Four G. E. Generators for Dnieper River

FOUR vertical-type hydro-electric generators rated at well over 100,000 hp. each are now under manufacture at the Schenectady works of the General Electric Company on order from the Union of Socialist Soviet Republics. They are to be installed in the plant which Hugh L. Cooper is building on the Dnieper River in the Ukraine. The generators will be driven by water turbines now being built by the Newport News Shipbuilding & Drydock Company. The last shipment is scheduled for the fall of 1932.

▼

Massachusetts Commission Against Couzens Plan

TO THE many state bodies in charge of utility regulation that have protested against the Couzens bill and other plans to bring about federal control of interstate transmission has been added the Massachusetts Department of Public Utilities. A long statement just put forth by it and transmitted to John E. Benton, general solicitor of the National Association of Railroad and Utility Commissioners, for presentation to the Senate interstate commerce committee, which is holding hearings on the Couzens bill, says:

"The regulation of public utilities should never be undertaken except where there is no other way of obtaining effective regulation. Experience has shown that the regulation of public utilities by federal authority is at best cumbersome. . . . So far as we are aware there is no necessity at the present time for placing under federal jurisdiction the regulation of the electric power companies or the rates charged thereby."

The Massachusetts commission draws attention to its own efforts to prevent, by insisting on short-term contracts, the only danger it sees in transmitting electricity across state lines—that which might arise from an "improvident" price charged by a power company to a local distributing company owned by it in another state. The document concludes with a commendation of Massachusetts' regulatory methods and the expression of a belief that the invasion of federal authority, with the Supreme Court's Fourteenth Amendment decisions, will promote public ownership in that state.

Science of Electronics to Have a Mouthpiece

TO CARE for the new science and art embracing the vacuum tube, the photo-electric cell and cognate appliances, the McGraw-Hill Publishing Company will begin the publication in April of a monthly under the editorship of O. H. Caldwell, editor of *Radio Retailing*, who was formerly a member of the Federal Radio Commission and was the first editor of *Electrical Merchandising*. It will be called *Electronics*, and its field will embrace "every plant and laboratory throughout the world where a vacuum tube is made or has an application."

In explanation of the wide scope of the coming publication the publishers say:

In the field of *Electronics*, the vacuum tube is the common denominator, having the same importance as the steam turbine or Diesel engine or dynamo has to its industry. This new electrical "lever" is penetrating into dozens of specialized industries and products, of which the following are examples: Sound pictures, telephony, telegraphy, broadcasting, radio receivers, phonographs, beacons, aviation, metering, television, machine control, compasses, geophysics, automatic processing, crime detection, counting, traffic control, beam transmission, carrier systems, fac similes, analysis, therapeutics, photo-cell applications and electric recording.

▼

Many Viewpoints on St. Lawrence Development

VIEWS concerning the hydro-electric development of the St. Lawrence River continue to find utterance pending legislative action on the measure for a Governor-appointed commission of inquiry and the calling of the public hearing promised by the state executive.

The Socialist party asks that the bill be amended so that the commission to be appointed by the Governor shall bring in recommendations for the development of all New York State power sites. The party asks also that the commission give equal consideration to all proposals for power development.

Asserting that the problem is purely a business one, Floyd L. Carlisle, chairman of the Niagara-Hudson Power Corporation, in a summary of the view he expressed recently before the committee considering revision of the public service law, says that his company, exercising certain proprietary rights, is prepared to settle the problem with the primary object of serving the consumers of electricity and the state itself. The assertion is made in the newspapers that the Niagara-Hudson, far from attempting to thwart the Governor's project, will co-operate with him.

Two Canadian engineers appointed by the Montreal Board of Trade—Henry Holgate (who died this week) and J. A. Jamieson—to report on the whole navigation and power program oppose it as uneconomic so far as Canada is concerned.

Meanwhile Governor Roosevelt in public utterances continues to assert that the Republican party has surrendered—a statement that the state leaders of that party are resenting.

▼

Supreme Court Decision "Reacts" In California

REVOCATION by the California Railroad Commission of its recent decision fixing the rates of the Southern Sierras Power Company, Riverside, on a basis which resulted in a reduction to the consumers of that company of approximately $300,000 a year may be the outcome of the finding rendered on January 6 by the United States Supreme Court in the case of the United Railways & Electric Company of Baltimore versus the Public Service Commission of Maryland. As reported in the ELECTRICAL WORLD for January 11 (page 87), in this case the court held that depreciation should be computed on the basis of present fair value and not on the basis of original cost.

In issuing an order for a rehearing last week the California commission said that when in November last it fixed the rates to be charged by the Southern Sierras Power Company the operating expense of depreciation was computed on the basis of the cost of the depreciable physical property and that the matter should be reconsidered.

Fight Municipal Plant Absorption in Nebraska

RESOLUTIONS have been adopted by the Nebraska League of Municipalities calling for the submission by initiative of two of its bills that the last Legislature refused to pass. One proposal grants permission to municipalities owning electric lighting plants to construct lines into rural territory and pay for them from future earnings of the line. The other permits several villages and towns to combine their financial resources to erect a central generating plant.

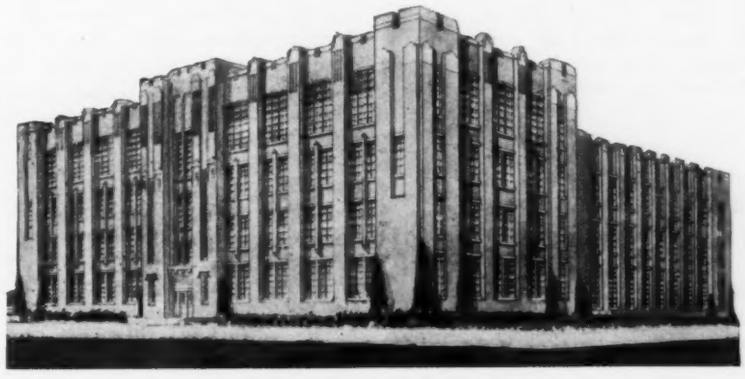
Attorney-General Sorensen says that these laws are necessary to preserve the municipal plants from being absorbed by the power companies, a process that has been going on for a half dozen years, increasing numbers of the smaller town plants being made a part of what he calls the "power trust."

▼

Kentucky Governor Strong for Cumberland Plant

CUMBERLAND FALLS occupied a considerable part of Governor F. D. Sampson's message to the Kentucky Legislature, now in session. The Governor is strongly in favor of the power plant that the Insull interests want to build there as against a state park to be paid for by T. Coleman du Pont. He contracts the two proposals and says:

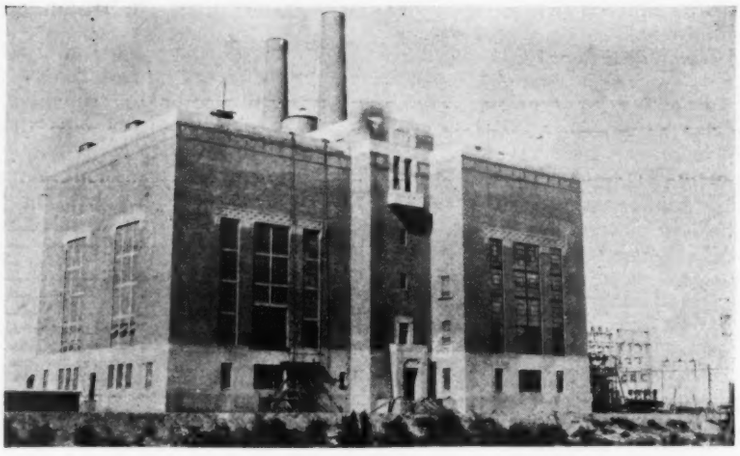
In answer to the often-repeated assertion that the falls will be destroyed by the power company, let me say that must not and will not be done. The contract specifically provides and so will the federal permit, if granted, that the power company is not to disturb or mar the falls or the surroundings in any way.



ANOTHER TECHNICAL COLLEGE BUILDING

To the imposing technical college structures of the country will be added this year an electrical-mechanical engineering building at Houghton, Mich., for the Michigan College of Mining and Technology. Electrical laboratories will fill a good part of the space.

ON THE BANKS OF THE RIO GRANDE



Recently put into operation by the El Paso (Tex.) Electric Company on the banks of the Rio Grande in that city, this steam plant has an initial capacity of 25,000 kw. and is planned for an ultimate rating of 150,000 kw.

Cumberland (Md.) Firms May Support New Station

A PLAN to erect seven impounding dams on Stony River, near Schell, 30 miles west of Keyser, W. Va., and build a large steam-electric generating plant at an estimated cost of $4,000,000 was submitted to representatives of Cumberland (Md.) industries during the early part of January by representatives of a group of West Virginians. It is said that this project, if carried out, will be financed by Chicago capitalists already engaged in electric development.

The erection of impounding dams on Stony River and the building of a steam-driven station, with an unlimited supply of coal near by, would produce, supporters of the plan say, 120,000 kw. of electrical energy. The Stony River is a tributary of the Potomac, and the project was divulged at a meeting of the Upper Potomac River Board at Cumberland on January 8.

▼

Seattle's Right to Build Lines Outside City Denied

IN AN opinion given to Mayor Frank Edwards of Seattle, Thomas J. L. Kennedy, corporation counsel, has ruled that Seattle's municipally owned light department has no right to extend its services farther outside the city limits. This opinion agrees with the contention of A. W. Leonard, president of the Puget Sound Power & Light Company.

It is just possible that this opinion may change the trend of City Hall discussions of a recent offer of the power company to buy out the municipal service lines outside the city limits, representing an investment estimated at about $150,000. The offer brought a protest from J. D. Ross, superintendent of city lighting, who held that, contrary to Mr. Leonard's views, it would be perfectly legal for his department to keep on reaching out for suburban business so long as it did not invade any other incorporated city.

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A 350,000-Hp. Plant for the Pend Oreille, B.C.

ON THE Pend Oreille River in British Columbia, about 17 miles from its junction with the Columbia, the West Kootenay Power & Light Company plans a hydro-electric development of 350,000 hp., according to plans submitted to the provincial authorities. The ultimate cost of this project is estimated at approximately $18,000,000, and it will involve the building of a dam 350 ft. high. The company expects the plant to be completed four years from the date of commencement. The chief customer for the power would be the Consolidated Mining & Smelting Company at Trail.

The scheme is said to be unique in that it enables a Canadian company to take all the power from an international river that is obtainable in Canadian territory without interfering with American territory. The investigation at present under way for impounding the water further up the river in United States territory may prove of great value to Canada by adding greatly to the water volume available for use by the West Kootenay company. It is estimated that maximum output might thus be raised to more than 400,000 hp.

The British Columbia Water Control Board has also received an application from the Reeves-McDonald Mining Company for authority to proceed with a two-million-dollar power development on the Pend Oreille. The board has reserved decision until such time as the West Kootenay Power & Light Company has filed its plans.

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D. C. Court of Appeals Highest Radio Tribunal

FINAL jurisdiction in all cases arising under the federal radio act is vested in the Court of Appeals of the District of Columbia, and the United States Supreme Court will not review its findings. This decision, pronounced on Monday of this week by Supreme Court Justice Holmes, temporary head of the highest tribunal in the absence of Chief Justice Taft, in a dispute over time allotment, has far-reaching importance for the radio industry. Interpreting it, P. D. P. Spearman, assistant general counsel of the Federal Radio Commission, said:

"The net result of the action of the Supreme Court is, in effect, a declaration that the Court of Appeals of the District of Columbia may hear and try all radio cases brought to it from the Federal Radio Commission and enter such decision as it may think proper without regard to the decisions of the Radio Commission."

At the offices of the Radio Commission it was said that an effort will be made to change the law and that an amendment will be submitted to Congress which would limit the authority of the District Court of Appeals to judicial phases of radio regulation.

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Radio Patents Discussed Before Senate Committee

CROSS licenses and the pooling of patents were urged before the interstate commerce committee of the United States Senate on January 20 by L. J. Williams of the Grigsby-Grunow Company, Chicago. He said that under the set-up now planned for the Radio Corporation of America, Westinghouse and General Electric, a burden which licensees will not be able to bear will be created.

Mr. Williams asserted that Westing-

house and General Electric are going out of the manufacturing end of radio and that the new company owned by the three big firms will do both manufacturing and selling, the Radio Corporation becoming merely a patent and stockholding company. This means, he stated, that licensees will not only have to compete with low-cost Radio Corporation products bearing no royalties, but also with similar General Electric and Westinghouse brands, as the two latter will be furnished with radio products under their own respective trade names.

Senator Couzens, chairman of the committee, expressed the opinion that the small manufacturers should fight in the courts for their patent rights instead of coming to Congress.

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Congressional Activities with Electrical Interest

NOTICE of the Bonner-Russell-King accounting controversy in the Federal Power Commission has been taken by the Senate committee on interstate commerce, and it has called on members of the commission to supply it with copies of all opinions and letters or memoranda having to do therewith received by them from the chief counsel, assistant counsel, solicitor and chief accountant of the commission. Secretary Bonner is directed to turn over to the committee all similar memoranda and letters sent by him. The House committee on appropriations is looking into the same subject.

Ratification of a treaty with Canada for the construction of remedial works in the Niagara River will have to be delayed until the Senate disposes of the tariff bill, according to statements recently made by Senator Borah, chairman of the foreign relations committee.

A bill has been introduced by Senator Ransdell authorizing the establishment of a national hydraulic laboratory at the Bureau of Standards in Washington. Similar bills have been introduced in past sessions of Congress, but have failed to receive the sanction of the rivers and harbors committee of the House. The Senate, however, passed a national hydraulic laboratory bill during the last regular session.

Legislation authorizing the changing of the name of Boulder Dam to Hoover Dam has been introduced by Senator Smoot of Utah.

One by one the legal conundrums presented by the Boulder Canyon project act have been interpreted by Edward C. Finney, solicitor of the Department of the Interior. All told, fourteen opinions have been rendered by him, and these have been consolidated in a memorandum submitted to the Secretary of the Interior.

The Federal Trade Commission has sent out questionnaires to obtain statistical data for the inquiry into intersate power called for by the Senate. This resolution directs the commission to ascertain and report the quantity of electrical energy used for development of power or light generated in any state and transmitted by any means from the state in which it is generated into any other state. The commission is also to inquire into the percentage of electrical energy consumed in each state which is imported from other states.

Legislation which would prohibit the ownership of the operation of radio broadcasting stations by public utilities or their subsidiaries will be offered at Washington by Senator Brookhart of Iowa, according to him. At a hearing of the Senate committee on interstate commerce relative to the Couzens bill, Senator Brookhart declared that he believed public utilities should not be accorded channels and said he would offer an amendment to the pending bill to exclude them.

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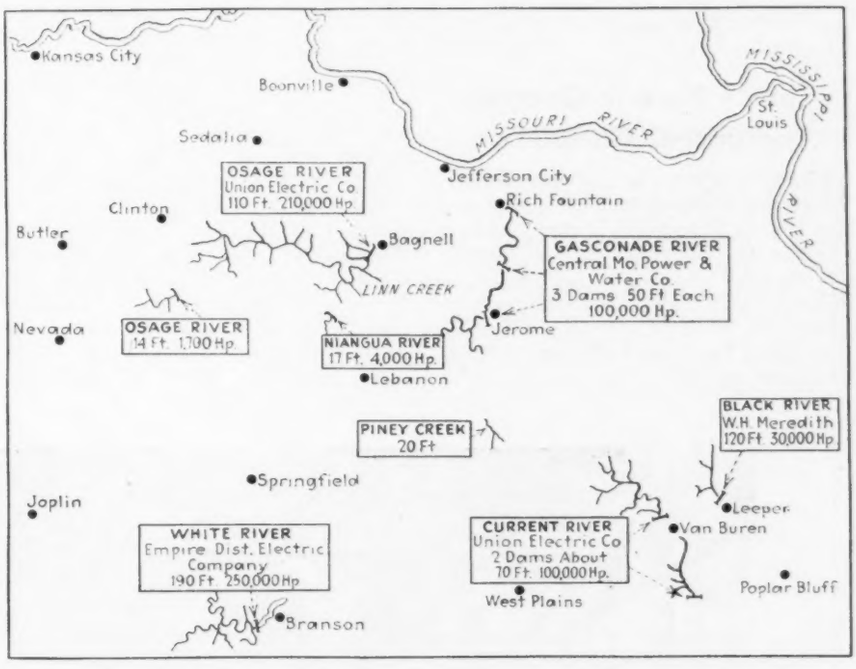
Missouri's Ozarks to Be Transformed



HYDRO-ELECTRIC projects in the Missouri Ozarks which, if developed to the full extent of their potential capacity, will bring about the generation of 700,000 hp. and cost high in the millions are getting beyond the paper stage. A report by H. C. Beckman for the Missouri Bureau of Mines and Geology lists five large and apparently well-backed undertakings with government licenses or permits. These projects are as follows:

Osage River—The Union Electric Light & Power Company, St. Louis, is now preparing to build a dam 110 ft. high, forming a lake covering 86 square miles and 96 miles long; capacity, 210,000 hp.

Current River—The same company has preliminary permits to build two dams, one near Van Buren, the other above Doniphan, each about 70 ft. high; combined capacity of the two dams, 100,000 hp.

White River—The Empire District Electric Company, Joplin, will build Table Rock Dam, 7 miles above Hollister, to a height of 190 ft., costing $35,000,000; capacity, 250,000 hp.

Gasconade River—The Central Missouri Power & Water Company holds preliminary permits to build three plants between Jerome and Rich Fountain, each dam to be 50 ft. in height, making an almost continuous lake 100 miles in length; combined capacity, 100,000 hp.

Black River—W. H. Meredith holds a license to construct a dam 120 ft. high at a point above Leeper; rating, 30,000 hp.

Other projects are scheduled for construction on the Niangua and Big Piney Rivers. The Kansas City *Journal-Post* prints the accompanying map, which indicates the coming industrial revolution in the famous backwoods district.

Parallel Operation from New Orleans to Kansas City

ANOTHER important experiment in the successful operation of interconnected power lines was taken recently when leading light and power companies of the Southwest succeeded in establishing a simultaneous interconnection extending from New Orleans to Kansas City, a distance of about 900 miles. The experiment was conducted successfully for eight hours over interconnected transmission lines in Louisiana, Texas, Oklahoma, Arkansas, Kansas and Missouri. Electric plants serving more than a thousand towns were operated in parallel throughout the period. There was no interruption during the test period, and all plants in the long chain were in communication with each other.

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County Plant in Georgia Approaches Completion

BELIEVED to be the first county-owned hydro-electric development in the United States, the power plant at Cordele, Ga., owned by Crisp County, is scheduled to begin operations on April 1, 1930. It is designed for an ultimate capacity of 18,200 hp. In the first instance it has been built for 9,600 hp. at a cost of $1,250,000.

A distinctive feature is the use of two types of waterwheel runner, the Francis and the Propeller, so that it may possess extremely high efficiency at normal head and high power when floods cause low head. For loads from 1,400 hp. up the efficiency is to be at least 87.29 per cent; the average efficiency from 4,500 hp. to 10,000 hp. is to be 90 per cent.

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Oneida-Rome Line Ready in Upstate New York

COMPLETION of the 110-kv. transmission line between Oneida and Rome, N. Y., which has been in process of construction for three months, is reported. This new connection, the joint project of the Northern New York Utilities and the New York Power & Light Corporation, both operating units of the Niagara-Hudson power system, is planned to give Rome a source of energy supply from the Mohawk-Hudson transmission lines supplementing that which it now receives from the Northeastern Power system. It is one item in a large interconnection program.

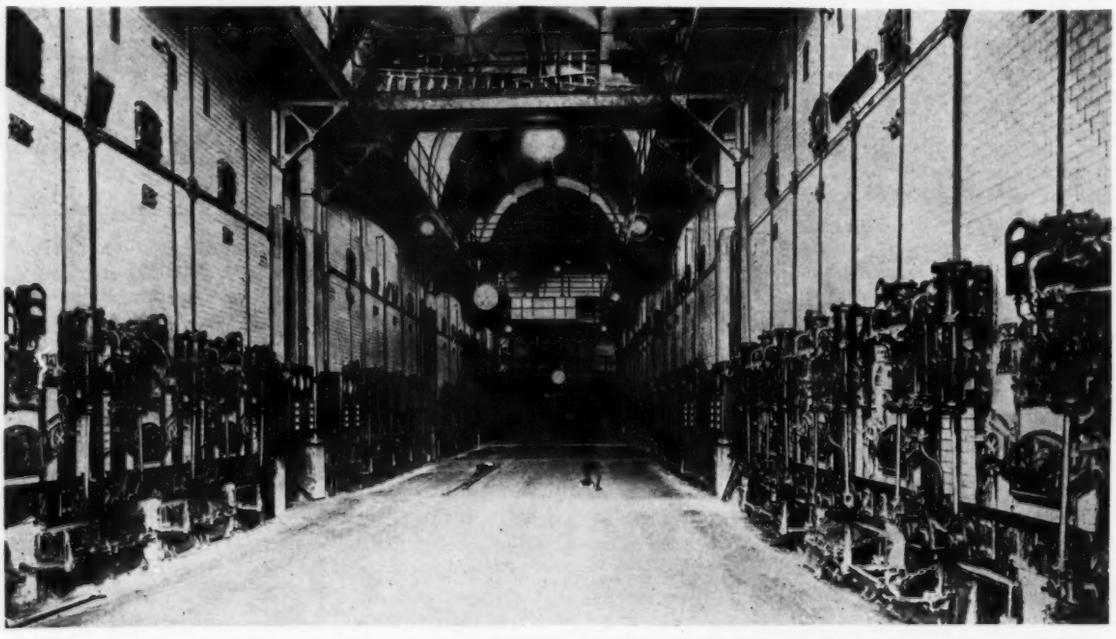
The Oneida substation, which is one terminal of the line, is an important transmission center on the Mohawk-Hudson system betweeen Albany and Syracuse. The new line is about 18 miles long, of steel-tower construction with about 800-ft. spacings and erected on a right-of-way 100 ft. in width.

New Jersey, Too, Ponders Regulation of Utilities

RECOMMENDATIONS of a comprehensive character have been made to Governor Larson of New Jersey by the National Institute of Public Administration for proposed new state departments. These proposed changes are classified as constitutional, statutory and administrative. Regarding the regulation of public utility companies the report advocates the following changes:

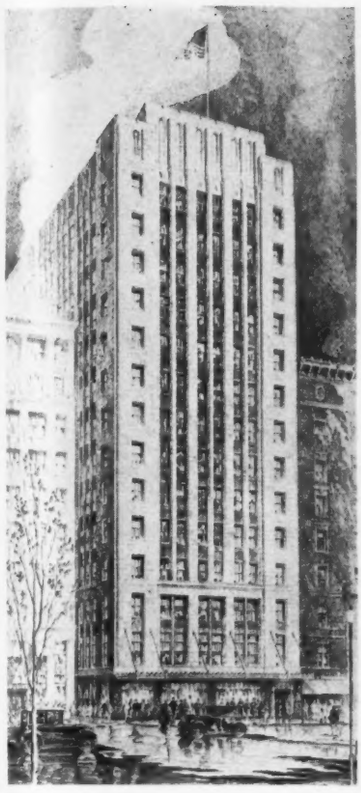
1. Establish a Department of Public Utilities, with a single administrative head, abolishing the Board of Public Utility Commissioners and requiring that all quasi-judicial work be handled by the commissioner of public utilities and two subordinate officers acting as his associates for this purpose.
2. Abandon the Trenton office.
3. Amend the laws to prevent overlapping between the Department of Public Utilities and other departments in the matter of private water companies and accounting systems used by publicly owned utilities.

In his annual message, the Governor, adverting to a decision of the United States Supreme Court setting aside so much of the franchise tax of the New Jersey Bell Telephone Company as represented receipts from interstate business, said: "I recommend that consideration be given to this subject in order to avoid the present situation resulting from this decision under which companies will escape entirely any franchise tax or taxes for the use of public streets on all interstate business."



CONVERTING HEAT INTO ENERGY ACROSS THE ATLANTIC

Interior view of the automatically controlled boiler room in the Golpa-Tschornewitz power house, largest in Germany



Boston Edison Offices to Be Arc-Welded

TWO office buildings for light and power companies, one on the West and the other on the East Coast, soon to be erected, are to employ electric arc welding. These are the thirteen-story structure to be built for the Southern California Edison Company in Los Angeles, described and illustrated in the ELECTRICAL WORLD for August 4, 1928 (page 229), and the fourteen-story structure to be built for the Edison Electric Illuminating Company of Boston, illustrated herewith.

Seven electric welding sets, one being for reserve, will be utilized in the erection of the 1,200-ton steel frame of the new Tremont Street office building of the Boston Edison company, to be built this year at an approximate total cost of a million dollars. The estimated cost of the welding job is about $10,000. "Sound movies" are to be taken to compare the silence of electric welding with the time-dishonored "rat-tat-tat" of riveters.

In the case of the Southern California Edison Company all steel work with the exception of the first four stories will be electric-arc-welded. The steel in the first four stories will be partly welded and partly riveted. An interesting feature of the Los Angeles building is the special design to provide against the contingency of earthquakes. All of this earthquake bracing will be welded by the electric arc method.

Another application of welding to building construction will be made in Schenectady, N. Y., where a new city hall is to be constructed by this method. General Electric engineers point out that the art has now progressed to a point where in many cases it is actually less expensive to construct by welding than by riveting.

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Drought Causes Speed on Mexican Construction

EXTRAORDINARY conditions of drought in northern Mexico led to work being pushed day and night on the first 6,000-kw. generating unit of the Francke station of the Compañía Nacional de Electricidad, a subsidiary of the American & Foreign Power Company, and on a 200-mile transmission line from that station, which is near Torreon, to the Boquilla hydro-electric plant, which is owned by an affiliated company.

Ground was broken for the station on July 2 last, and work on the transmission line, which was designed for 132 kv. and is operating at 110 kv., was begun about August 1. A second 6,000-kw. unit is virtually ready, while a third of 15,000 kw. capacity will go into operation about March 1. The building of the Francke station and transmission line breaks all records for such construction among the companies supervised by the Electric Bond & Share Company.

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Lochaber Added to Scotch Hydro Plants

WORK on the Lochaber hydro-electric power scheme in Scotland, which was commenced in 1925, has reached almost its final stages, and the machinery has been subjected to thorough tests. Water from subsidiary streams was passed into the 15-mile tunnel which has been driven through the solid rock of the Ben Nevis range, and the turbines were run light at full speed. Final trials will come when the last rock barrier excluding the waters of Loch Treig from the tunnel has been blasted away, which is expected to be before the end of January.

The construction work already done has cost approximately $10,000,000 and has provided employment for about 2,000 men for four years. The British Aluminum Company, which is promoting the project, is to ask in February or March next for Parliamentary powers to utilize also the waters of Loch Laggan and the River Spean. It proposes to erect a dam across the Spean in order to divert the waters of that river by a tunnel into Loch Treig.

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Dayton-Springfield Line Is Tested for Service

A FIRST test of the 66,000-volt power line which now connects the Dayton Power & Light Company's system with that of the Ohio Edison Company at Springeld, Ohio, was made recently by transmitting energy for one hour from Dayton to Springfield and then reversing the process for a second hour. Officials of both companies stated that the operation of the line was entirely satisfactory. The line may later be used to furnish power regularly from Dayton to Springfield to supply energy for peak loads in the latter city.

Coming Meetings

American Institute of Electrical Engineers—Winter meeting, New York, Jan. 27-31. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Wholesalers' Association—Pacific Division, Del Monte, Calif., Jan. 31-Feb. 1.

Artistic Lighting Equipment Association—Washington, Feb. 9-15. C. L. Benjamin, 420 Lexington Ave., New York.

Empire State Gas and Electric Association — Commercial Section, Rochester, Feb. 13 and 14. C. H. B. Chapin, Grand Central Terminal, New York.

Northwest Electric Light and Power Association — Commercial Section, Spokane, Feb. 13-15; Accounting Section, Portland, March 17-18; Engineering Section, Aberdeen, Wash., probably week of March 23. B. Snow, 1206 Spalding Bldg., Portland, Ore.

North Central Division, N.E.L.A.—Engineering Section, Nicollet Hotel, Minneapolis, Feb. 24-25. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Oklahoma Utilities Association — New Tulsa Hotel, Tulsa, March 11-13. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

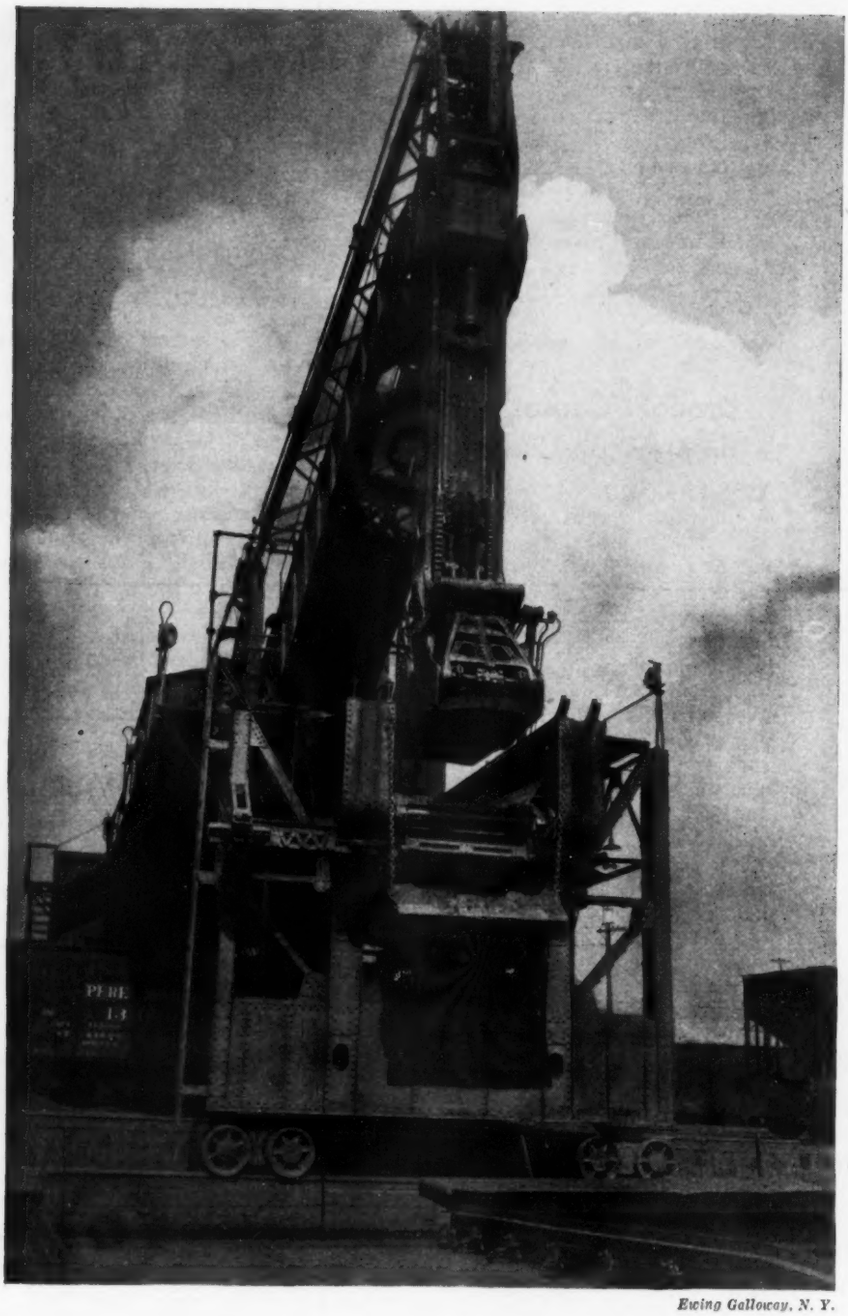
Illinois State Electrical Association—Hotel Abraham Lincoln, Springfield, March 19-20. George Schwaner, 205 Illinois Mine Workers' Building, Springfield.

Pacific Coast Electrical Association—Commercial Section, Fresno, Calif., March 20-21. G. T. Bigelow, Southern Sierras Power Co., Riverside, Calif.

Southeastern Division, N.E.L.A.—Bon Air-Vanderbilt Hotel, Augusta, Ga. April 15-17. C. M. Kilian, 207 Bona Allen Bldg., Atlanta, Ga.

Middle West Division, N.E.L.A.—Fort Des Moines Hotel, Des Moines, Iowa, April 23-25. Thorne Browne, 1527 Sharp Bldg., Lincoln, Neb.

National Electric Light Association—San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.



Ewing Galloway, N. Y.

SHIP TO CAR IN 7-TON BITES

IRON ORE is transferred from steamers to cars in a Gargantuan manner by electrically operated hoist. Every penny counts here. Wherever materials or products must be moved electricity aids in time and production savings.

EDITORIALS

L.W.W. MORROW
Editor

Play Fair with Patents

THE fathers of the Constitution initiated the present patent system for the stated purpose of giving inventors exclusive rights to their discoveries. Present business conduct and practice make it difficult to carry out this intent. Most inventions are made by employees of corporations, and the usual direct recompense is a dollar to the inventor. The corporations take over the patents and start competing with one another in similar lines of business by using their patent holdings as a business asset.

The next step is the patent pool formed by the original group of corporations starting a new branch of industry, because this is more economical than spending money in patent suits, and because the patent pool is an incentive to invention. Then, as the industry grows, the licensing of other corporations follows—a method that usually works out in the older patent-holding corporations in the pool holding a dollar advantage over their licensed competitors. Next comes conflict with anti-trust laws, such as was experienced last week by the oil-company patent-pool group, or the development of business bitterness within an industry, such as that now evident in the radio hearings at Washington.

Study should be given to the whole situation. Older corporations that go through the trials and costs of developing an art such as radio deserve some advantage over a new corporation that enters as a competitor at a later stage, and patents are a tangible lever for their use. But the use of the patent lever should not lead to excess in eliminating competition. Nor should patent troubles within an industry stifle its progress, cause litigation or bring a governmental investigating committee into the picture. All these things are losses to the industry concerned. Patents should be used widely to get business volume and to develop total business in a branch of industry.

Until reconsideration of the entire patent situation shall be had it is good policy for each industry to work out its patent problems within itself. Reasonable business men can agree upon the fair thing to do if they will gather about the conference table and place the cards face up. Any branch of industry will gain from its patents to the degree in which it plays a fair and square game.

Is Massachusetts Unique?

WIDESPREAD approval of the Massachusetts commission's unanimous opposition to federal regulation of interstate power as provided in the Couzens bill will unquestionably result from the reading of the board's trenchant criticisms of this cumbersome method of dealing with what is in reality, from the standpoint of the public, a problem of minor economic importance. The protest of the commission against the enactment of this bill is consistent with apparently concerted action by various state regulatory bodies, many of which have filed similar documents; but it differs from these in scope and conclusions.

Chairman Attwill and his associates declare that the Couzens bill would inevitably lead to the adoption in Massachusetts of standards and methods of regulation obtaining in other parts of the country. It further expresses the opinion that the Bay State public will be unwilling to pay the utilities a price which decisions of the United States Supreme Court intimate they are entitled to charge

under the Fourteenth Amendment to the Constitution. Such an attitude implies, if it does not assert, that regulatory methods in Massachusetts are better and more effective than those existing elsewhere and that the citizens of the commonwealth are unwilling to apply the same standards of value to their electric service as are acceptable in other jurisdictions and which, indeed, they themselves apply without protest to services and commodities other than those furnished by public utilities.

The records do not show that public utility rates in Massachusetts are lower than those elsewhere, that the service is better, or that the owners of utility property receive a higher return. In the absence of such advantages it is not obvious that Bay State regulatory methods are superior to those practiced outside, nor is it clear that Massachusetts people in general desire preferential treatment or exemption from commonly accepted economic laws.

The stand of the commission against the Couzens bill is indeed gratifying, but some of the conclusions reached by the board raise the query whether the members of the commission have not misinterpreted the situation and perhaps misunderstood the attitude of the public with reference to utility service and its fair cost.

Reconstruct the Weak Links

INTERCONNECTION of large utilities has progressed so rapidly that many of the earlier interconnections are too small to hold together the systems for which they were designed. This is due chiefly to the tremendous additions of generating capacity. Many of these weak links are still the pride of the companies they interconnect, and the respective managements fail to recognize that interconnections which were perfectly adequate when installed may become useless as permanent ties, although they may be suitable as emergency connections.

Many weak ties are now obstructing logical economic interconnections. For example, one of two systems which are now connected by a weak link with other properties is much more logically associated with them under present conditions than is the system at the other end of the weak tie. Weak links and contracts covering them should be reviewed in the light of existing and future conditions. Proper equities should be reconsidered by the companies involved, and the weak links should either be reconstructed so as to be heavy enough to meet their new requirements or they should be left open at one end with the idea of providing emergency reserve.

Distribution Is the Key

PROSPERITY depends upon increased sales as never before. Up to this time the attention of the industry has been focused on production largely because there has been little necessity for selling. The buyers wanted electrical products and electric service and asked the producers for them. But now the industry realizes that it has a sales problem. This, in brief, is to create a desire to purchase electrical products and use electrical service and then to get the goods and the service to the buyers economically.

This program calls for industry co-operation. It calls for the use of market studies. It calls for a sales organization that intelligently uses selective selling, straight-line outlets, installment buying and other sound principles of distribution. A widespread wish on the part of the public for new things and changed things must be aroused, and the healthy dissatisfaction of people with what they have must be turned into purchases from the electrical industry.

Electrical markets are known. They have been surveyed and resurveyed. Electrical producers have statistics that show very large opportunities for business in the home, in general industry and on the farm. The data have been available since 1926, and quite consistent attempts have been made to "sell" the markets. But progress has been slow and results have been disappointing because the industry is not geared up to do the selling in an adequate or an economical manner. Each branch does its own selling in its own way. Each unit sells its own product or service. As a consequence, very often the industry has been worrying potential buyers rather than selling to them, and often a unit has plunged itself into hot

water. Sales costs are out of all proportion to the business done.

Selling will not be done in volume or economically until the team-play idea is brought to bear. All branches must tie into an intelligent and economical distribution program that reaches from national action at the top to the work of each salesman at each sales outlet. No greater need appears than that the electrical industry as a whole and in each branch shall have a survey made to fix the sales methods, principles and organizations necessary to capitalize upon the market opportunities. It is not a time for theory or talk. It is a time for the institution of a distribution organization that will get volume sales in an economical manner.

Straining at a Gnat and Swallowing a Camel

NOT many utility executives and engineers are willing to admit that their engineering expense for generation and transmission is all out of proportion, considering the ratio of generation and transmission losses to distribution losses. Distribution losses are in round numbers 70 per cent of total system losses, yet utilities will spend perhaps three times as much for transmission and generation engineering as they do on distribution. They fight for the last quarter of one per cent in efficiency of generators, high-tension transformers and transmission lines and seem to forget that a gain of the same fractional percentage in efficiency in distribution is relatively more than twice as important.

When it is considered that 30 per cent of the energy generated never finds its way to the customer's meter and that 70 per cent of this loss occurs in the distribution system, it is clear that the distribution system has been neglected. If some of the high-priced skill that has been brought to bear on the 30 per cent end of the losses were swung over to the 70 per cent end, would there not be more hope of getting somewhere? Have not the utilities been straining at a gnat and swallowing a camel? Why not have a searching analysis of distribution losses and some real concentration on the distribution end of the business?

What Is the Basis of Sufficient Light?

ANY one studying the report on lighting presented recently at a New York Section meeting of the A.I.E.E. and published in last week's ELECTRICAL WORLD will find therein considerable food for thought. Roughly, the report indicated—nay, apparently proved—that the American nation is "light-saturated" only to the extent of about 30 per cent, if we are to take sensible lighting costs as a basis, or only to about half that percentage, if we are to consider optimum conditions for best seeing.

There seems to be a plurality of fact, psychological and experimental, pointing to the fundamental that the human eye inherited through past generations a habit of functioning best under very much higher intensities of artificial lighting than we have been giving it. In brief, it has been apparent that costs, and not visual acuity or eye comfort, have so far set the standards for foot-candles. Taking artificial lighting as a whole, it has been said that standards on the order of 5 foot-candles should be replaced by levels of perhaps 50 foot-candles. We would see more easily, more quickly and more accurately if our artificial light were roughly multiplied tenfold. Why, then, have we been content with deficient lighting? We seem to have inherited some sort of an idea that we should not attain to higher levels of illumination, contrary to the fact that these higher levels can now be attained without undue expenditures.

Perhaps those responsible for designing lighting and wiring systems have not had any simple rules or guides that could be used in making plans. Perhaps the "Franklin" specification for lighting and the "red seal" specifications for wiring meet and remove this deficiency. Perhaps, further, calm thought has not been taken of the fact that lighting costs have decreased more rapidly than lighting intensities have increased.

If the methods are at hand to guide the architect and the contractor in designing adequately for better lighting systems, there seems need for further dissemination of information such as the above-mentioned report of the A.I.E.E. and for some action that will convince the general public of the foolishness of holding to outworn lighting standards with no fundamental basis.

Quick Short-Circuit Calculations

By OTTO MUEHLEISEN

West Penn Power Company, Pittsburgh, Pa.

CALCULATIONS for three-phase short circuits are necessary to determine ratings of equipment, system operating stability and the service characteristics of different parts of a system.

THESE calculations are laborious and difficult to make and calculating boards have been developed to expedite the work. These boards have been of many forms and several have been described in *Electrical World,* but the board used on the West Penn System has many unusually flexible features and is an example of the latest developments in calculating system performance by use of a miniature system.—EDITORS.

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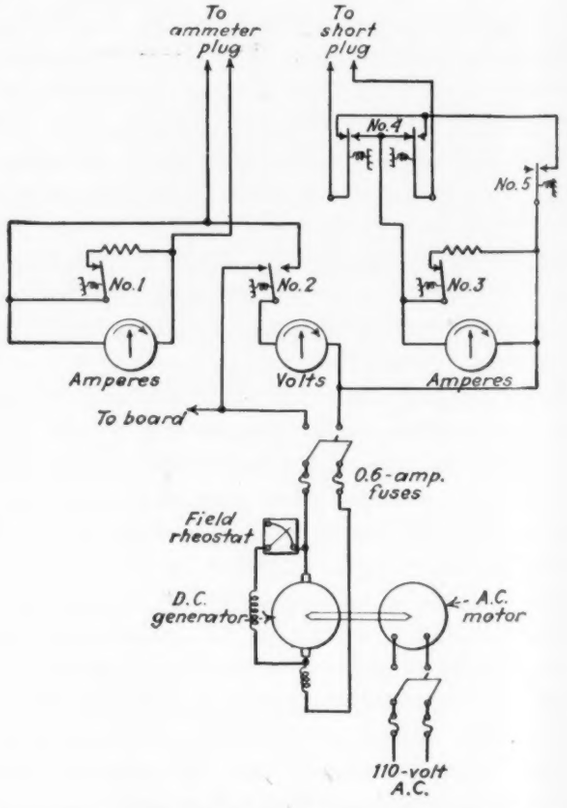
IN ORDER to compute the magnitude of three-phase short-circuit currents in present power systems and in their future development or in case of any change in the systems calculating boards may be used with a great saving of time.

Since in the transmission of power over high-voltage lines the reactances of generators, synchronous condensers, transformers and lines are always large compared to the resistances a very close approximation can be obtained by calculating the reactances only. It is possible to replace the reactances by a set-up of equivalent resistors, representing the apparatus and lines, and the feeding alternating current by direct current.

The board used by the West Penn Power Company is of the fixed resistor type, with additional variable resistors provided for temporary changes and system extensions.

A 100-watt motor-generator set supplies direct current with a constant tension of 40 volts. The motor is connected to the house lighting circuits. The direct-current voltage corresponds to 25 kv. in the system on which value all resistors are based. The maximum direct current is limited to 0.5 amp., thus giving a minimum resistance = 40/0.5 = 80 ohms on the board. As the highest present short-circuit current does not exceed 36,000 amp., referred to 25 kv., the corresponding resistance in the system is $\frac{E}{\sqrt{3}} \div I = \frac{14{,}430}{36{,}000} = 0.4$ ohms. The ratio of resistances is therefore $\frac{80}{0.4} = \frac{200}{1}$ and the current on the board will be limited to 0.5 amp. when the values of the reactances, referred to 25 kv., are multiplied by the factor 200. The reactances of apparatus and lines of other voltages on the system can be reduced to values corresponding to 25 kv.

A single-line wiring diagram of the system covering sixteen panels is painted at the left of the board, showing the generators, transformers, lines, synchronous condensers, reactors and interconnections with foreign companies. These interconnections, which are open, are indicated by a symbol. Auxiliary buses are not shown except at Windsor and Rivesville power stations. All



Connections between calculating board and desk

oil breakers are shown, also the disconnecting switches and air-break switches that are essential for operation.

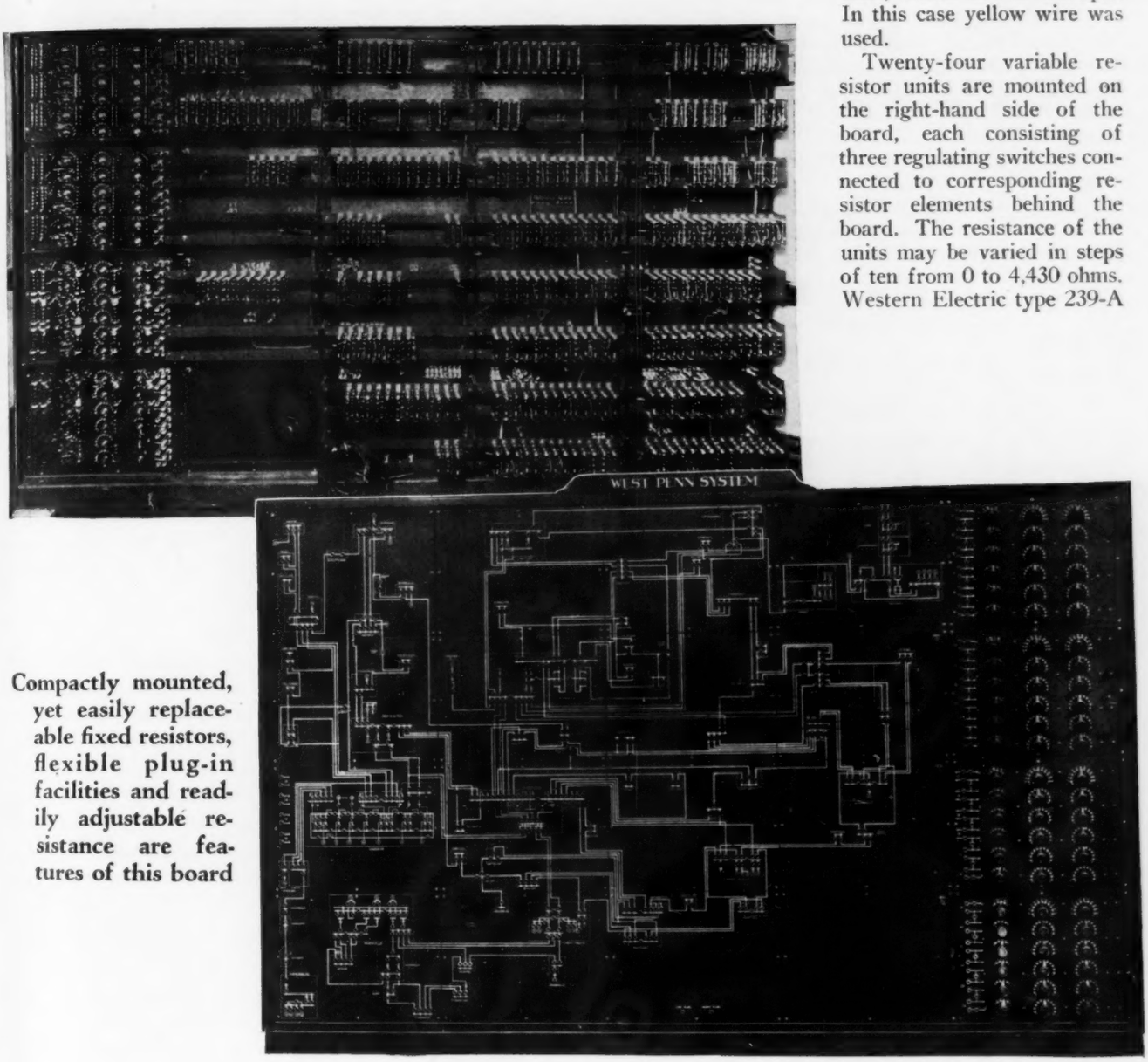
The switches, disconnects and air-breaks are represented by standard telephone jacks (type 239-A of the Western Electric Company). Standard telephone plugs (Western Electric Company type 110) are used to make additional connections. Dummy plugs, when inserted in the jacks, separate the double contacts of the jack. This corresponds to a breaker dropping out or the opening of a disconnect or air-break switch.

There are four sizes of resistor elements used, 70 ohms, 560 ohms, 4,480 ohms and some for 5,000 ohms. The latter kind has two terminals, while the others have, besides the terminals, two taps, thus subdividing the 70-ohm unit into sections of 10, 20 and 40 ohms, the 560-ohm unit into 80, 160 and 320 ohms and the 4,480-ohm unit into 640, 1,280 and 2,560 ohms. It is possible with three elements only to obtain any resistance in steps of ten from 10 to 5,110 ohms. For very high resistance the 5,000-ohm type is used in connection with the other elements. The elements thus combined give a unit of not more than three resistors, held together by two brackets.

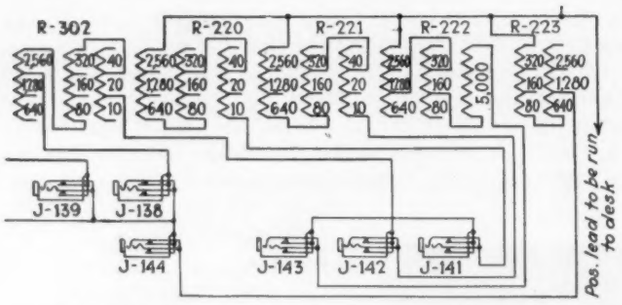
In the diagram on the front of the board, the lines coming to the jacks from above and from the left represent connections to the sleeve of the jack. Black wire was used for this purpose. The lines from below and the right represent connections to the tip and ring contacts, which are in multiple. In this case yellow wire was used.

Twenty-four variable resistor units are mounted on the right-hand side of the board, each consisting of three regulating switches connected to corresponding resistor elements behind the board. The resistance of the units may be varied in steps of ten from 0 to 4,430 ohms. Western Electric type 239-A jacks are provided on each end of each unit and between adjacent units. For convenience of operation a vertical row of eight jacks close to the left margin of the system diagram is provided. Each of these jacks is connected in series with the variable resistor jack in the same level at the right of the diagram. Either of two jacks which are connected in series may be used for making connections to the corresponding variable resistor unit and the use of long cords across the front of the board may thus be avoided.

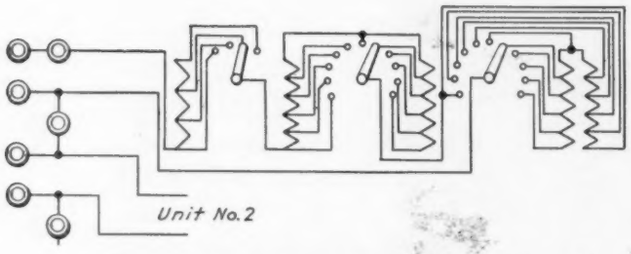
A number of flexible cords of different lengths and



Compactly mounted, yet easily replaceable fixed resistors, flexible plug-in facilities and readily adjustable resistance are features of this board



Variable resistors are connected to jacks



Three regulating switches control 24 resistor elements

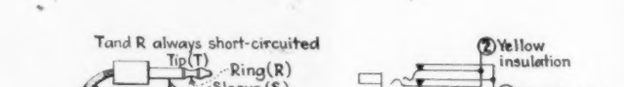
with various connections to telephone plugs on the ends are provided and may be used to obtain any combination between the resistors. It is possible to replace present lines and transformers by others, to add new lines and transformers, and to subdivide any line in order to get readings of the current and voltage at the exact location of a short circuit. The cords have two conductors of No. 18 stranded copper wire connected in parallel to the plugs. The outer layer of insulation on the cords is black braided cotton. Some of the cords are marked near the ends with either green or red paint, indicating the scheme of connection to the plug. A green mark indicates that on that end the cord is connected to the sleeve contact of the plug, while a red mark indicates a connection to the tip and ring contacts which are short circuited. An unmarked end indicates a connection to the tip, ring and sleeve contacts, all three contacts being short circuited.

Three jacks marked "GEN." are mounted on the right-hand side of the system diagram. They are directly connected to the positive lead of the direct-current generator and are used in connection with variable resistors to represent additional generators or synchronous condensers.

In order to make short-circuit studies in a given set-up of the system two double conductor cords with plugs on each end are provided. In each cord one conductor is connected to the sleeve contacts of the plugs, the other conductor being connected to the tip and ring contacts which are short circuited. By means of these cords connection may be made to any desired point on the network from a pair of jacks at the bottom of the board. From each of these jacks two wires lead to instruments and keys (switches) on the top of a desk in front of the board. The instruments are mounted flush with the surface of a bakelite panel which forms the front of a cabinet built on the top of the desk. All keys except one are mounted flush with the surface of another bakelite panel on the desk in front of the instrument cabinet. The other key is mounted in the left end of the cabinet.

One of the above-mentioned cords, marked with a broad white band, is inserted in the right-hand jack, which is marked "Short Plug" and is connected to the ammeter used for measuring the short-circuit current. The other end of the cord is inserted in a jack at the point where the short-circuit current is to be measured. A Western Electric Company type 136-A key (No. 4) in this circuit selects the current to be read. The middle position of the handle of this key (No. 4) permits total short-circuit current to flow through the ammeter, backward position (marked L.-A.) selects from the total flow that part coming into the "shorting" plug from the left or above, forward position (marked R.-B.) that coming from the right or below. The part of the current flowing around the ammeter when the type 136-A key is in the forward or backward position may be interrupted by a Western Electric Company type 115-A key marked No. 5. This is equivalent to that part of the system being cut off by breaker action. The ammeter now measures the short-circuit current coming from the remaining branches of the system.

The second cord, marked with a narrow white band, is inserted in the left-hand jack, which is marked. "Line Plug" and is connected to the ammeter used for measuring the line current. The line current may be measured at any desired place on the system by inserting the other end of this cord in a jack at that point. The line ammeter has the zero point in the middle of the scale, which permits the direction of flow of current to be determined.


T and R always short-circuited
Tip(T)
Ring(R)
Sleeve(S)
Cord with mark
Telephone plug No. 110
Yellow insulation
Black insulation
Telephone Jack No. 239A
Plug Symbols
T-R-S - Makes connection to ① & ② - No mark.
T-R - " " " ② only - Red mark on cord
S - " " " ① only - Green mark on cord
Jack Code
Black wire always leads to connection ① on front side of board
Yellow " " " " " ② " " " " "

CONNECTIONS		CORDS						
Sketch and Symbol	Code	LENGTH AND NUMBER Length in Feet ¼	½	1	2	5	8½	Total No.
S T-R-S	Green and Black	0	0	2	2	2	1	7
T-R T-R-S	Red and Black	0	0	2	2	2	1	7
S T-R	Green and Red	3	0	2	2	1	1	10
T-R-S T-R-S	Black and Black	0	0	2	2	2	1	7
S S	Green and Green	2	0	3	0	1	0	6
T-R T-R	Red and Red	0	1	2	0	1	0	4
S S T-R T-R	White and White	1-10 ft. cord for shorting plug with broad white mark. 1-10 ft. cord for line plug with narrow white mark.						2
		Grand total - No. of cords						43

Jack Symbols For Front of Board

Symbol for Dummy Plug

Dummy Plug (All Wood) To Interrupt Connections Between ① & ②

Temporary Dummy Plug (All Wood) No Interruption

Connections of and symbols for calculating board, jacks and plugs

A deflection to the right indicates a current flowing from left to right or from top to bottom through the jack in which the plug is inserted. A deflection to the left indicates a current flowing from right to left or from bottom to top through the jack.

The scale range of the "short ammeter" is 0 to 35,000 amp. and that of the "line ammeter" 0-15,000 amp. in both directions. The readings on these meters indicate system currents referred to 25 kv.

For very small currents a pressure on key No. 1 or No. 3 changes the readings to a ten times enlarged scale on the respective instruments. The limits for the enlarged scales are 3,500 amp. for the "shorting ammeter" and 1,500 amp. for the "line ammeter," the former having 70 divisions, the latter 2 × 30 divisions on the scale. On both instruments one division of the enlarged scale represents 50 amp. and one division of the primary scale represents 500 amp.

All measurements made at this jack and meter desk

A voltmeter in the middle of the cabinet panel serves two purposes. The normal connection gives the voltage impressed from the generator to the board, which is 40 volts. By pulling key No. 2 toward the operator the voltage between the point on the diagram where the "line plug" is inserted and the point of short circuit (potential zero) may be read. The voltmeter has an additional scale calibrated for system voltage, thus making it possible to read in kilovolts the voltage conditions in the network during a short.

The voltage of the generator is kept constant by a small additional resistance mounted in the extreme left side of the key board. A knob on top of it can be set for a proper adjustment.

The board is used for the calculation of short-circuit currents not exceeding 35,000 amp. in the system; that is, about 0.5 amp. on the board. In future extensions the current may be of a higher value.

Before putting the board in operation, any necessary connections should be made to represent changes or extensions of the system network. It is better to work according to a sketch previously prepared showing the connections and the resistances for which the variable resistors are to be adjusted. After checking the connections, switches, machines and other apparatus that are put in service for the particular investigation, the cords carrying the "shorting plug" and the "line plug" are brought into service. The motor-generator set is started by closing the left-hand switch above the set and voltage applied to the board and desk by closing the right-hand switch. The voltage, which is approximately set by a permanent resistance in the field circuit mounted on the rear of the board, is adjusted by means of a rheostat on the left-hand side of the key panel on the desk. The "short" ammeter now indicates the current flow caused by a short circuit at the point where the shorting plug is inserted. If this current is less than 3,500 amp. key No. 3 in front of the "short" ammeter may be pulled to obtain a larger deflection and the reading taken on the enlarged scale.

The same procedure is followed when reading the "line" ammeter. If the current indicated is less than 1,500 amp., key No. 1 in front of the "line" ammeter is pulled to obtain a larger deflection and the reading taken on the enlarged scale.

In order to measure the flow of short-circuit current from either side of the point where the short circuit occurs, key No. 4 at the right of the "short" ammeter is pushed to its backward or forward position. When the key is in the backward position the ammeter indicates the current flowing from the top or left only and when in the forward position the current flowing from bottom or right only, thus offering selective indications.

When key No. 4 permits the current to flow through the "short" ammeter from one side of the jack only, the current from the other side may be interrupted by key No. 5. This corresponds to the opening of a breaker, and the instrument now shows a different deflection on account of a new distribution of current.

When key No. 2 in front of the voltmeter is pulled toward the observer the voltmeter will indicate the sustained voltage of the system at the point where the "line" plug is inserted. By moving the "line" plug to other points on the board the distribution of the short-circuit current and the sustained voltages at these other points may be determined.

All values indicated by the instruments are for 25 kv. When readings of short-circuit current or sustained voltage are taken for a point in the system that normally has a voltage other than 25 kv. correction must be made to compensate for the difference in voltage.

Three different kinds of wooden dummy plugs are provided. Those having heads painted red separate the jack contacts and are inserted in jacks representing oil switches, air-break switches or disconnects that are normally open in the operation of the system. These plugs should not be removed from the jacks at any time except for test purposes and should be replaced after the test

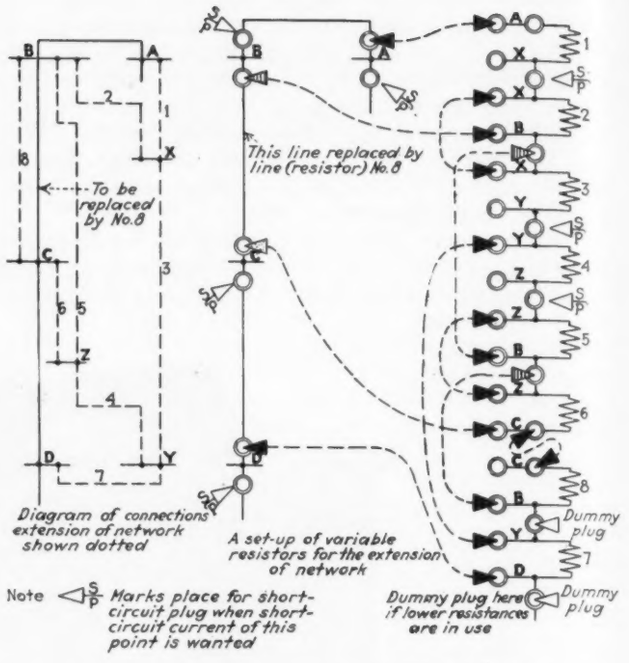
has been completed. In order that no mistake may be made in replacing the red plugs, other plugs, which are shorter than the red plugs and for this reason will not separate the jack contacts, are provided and should be inserted in every jack from which a red plug is removed. These plugs are marked with a red band. After the test the plugs with red bands should be replaced by solid red plugs. The unmarked dummy plugs separate the jack contacts and are used for test purposes. These plugs should be removed after the test is completed.

While most of the jacks on the board are connected according to the general scheme shown on page 194, the following exceptions are noted: On the variable resistor panels the left-hand row of jacks for resistors No. 1 to No. 12 inclusive and No. 17 to No. 24 inclusive; the eight variable resistor jacks at the extreme left of the board; the three jacks marked "GEN."

On each of these 51 jacks all five terminals are connected to one lead. With this connection, plugs marked black, green or red may be used indiscriminately for any connection as the tip, ring and sleeve contacts are short circuited. This condition is of considerable convenience when selecting cords for a set-up of variable resistors.

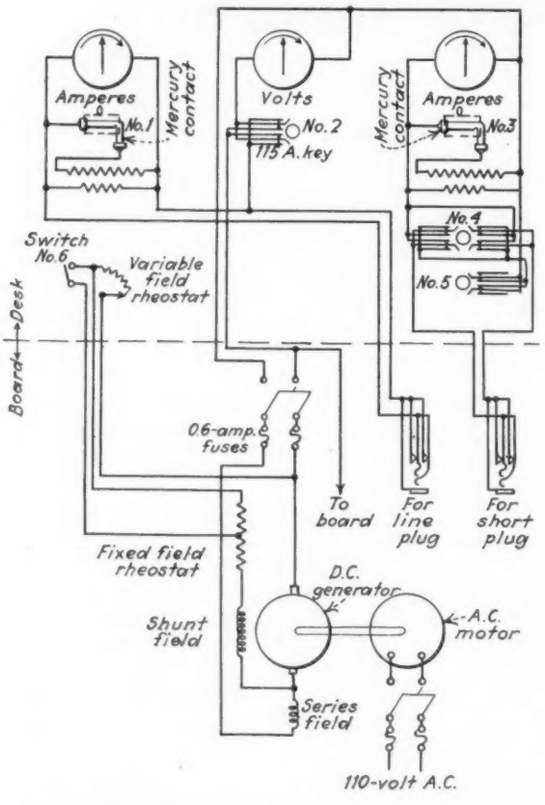
The accompanying example shows a set-up for three new substations X, Y and Z and seven additional lines as a future extension of the system network. The present line between substations B and C is replaced by another line called No. 8. The points at the several substations where the shorting plug might be inserted are marked by the symbol of this plug.

In this figure all the plugs in the left-hand jacks of the variable resistors are shown marked black. If the eight variable resistors shown are on the first, second or fourth panel from the top of the board it is not necessary to use plugs that are marked black, as all these jacks have five point connections and plugs marked red or green may, therefore, be used.


This line replaced by line (resistor) No. 8
To be replaced by No. 8
Diagram of connections extension of network shown dotted
A set-up of variable resistors for the extension of network
Dummy plug
Dummy plug here if lower resistances are in use
Note
Marks place for short-circuit plug when short-circuit current of this point is wanted

Example of a set-up to show flexibility of the calculating board

Thus the calculating board described above provides by a happy combination of flexibility and simplicity a very fast and reliable working device in the computation of three-phase short circuits. Measurements on the given system for any set-up of switches take just a few seconds, whereas formerly several days of calculations were needed. Set-ups with changes in the layout by use of the variable resistors are made in a few minutes. Therefore the calculating board has paid for itself in the first year of service and has given satisfaction to the West Penn Power Company.



Simplified diagram of board connections, keys and instruments

▼ ▼ ▼

Simplified Cable Joints Save $15,000 Yearly

A SUCCESSFUL attempt to simplify the type of 27-kv. cable joint used with accompanying savings in labor, time and money was reported by the underground systems committee of the Empire State Gas and Electric Association at a recent meeting.

The original joint, using three-conductor type H cable, called for a metallic shield made of lead foil over each conductor and laid over a conical base built up with cambric tape. The building up of this cambric base for the lead shield was rather a tedious proposition, six being required for each joint and the work being made

rather difficult by the tendency of the cambric tape to slip out of position. In addition, the joint was insulated with paper tape, which was hand wrapped. With this type of joint it was possible, in a working day, to complete the splice and fireproof the cable. However, the joint being oil-filled and sylphon-equipped, it was necessary for a follow-up crew to install the sylphon and pipe to the joint, a condition which was not entirely satisfactory.

In an attempt to eliminate this extra crew, the idea of a cast-lead cone, to be self-supporting, was developed and finally adopted. The use of this cone eliminated the necessity of forming the cambric base and saved between 1½ and two hours in assembling the joint. The use of cambric tape, packed in oil, instead of paper tape as the insulating medium, saved additional time and made it possible not only to complete the splice and fireproof the cable, but also to install the sylphon and pipe to the joint, entirely completing the work connected with this type of splice in a normal working day. This eliminated six crews of two men each and permitted their use in other fields, a saving of well over $15,000 a year.

▼ ▼ ▼

Pitch-Treated Poles Fail to Justify Practice

IT IS estimated by the Forest Service of the United States Department of Agriculture, which has recently conducted a carefully controlled investigation of lodge-pole pine poles, treated by barking the living trees, that such poles will have an average life in the Montana region of about eight years. Untreated lodge-pole pine poles in the same region have a probable life of seven years. While this relatively short increase in life may be enough to pay for the cost of treating the poles (about 50 cents), the engineers who conducted the investigation state that butt-creosoted lodge-pole poles treated by the open-tank method when used for similar service conditions would give a much longer life and would prove more economical.

Pitch-Treated Poles After Seven Years of Service

	Condition							
	Good		Partly Decayed at Butt		Badly Decayed at Butt		Sufficiently Decayed at Butt to Warrant Removal	
Number of Poles Examined	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
15	....	....	4	26.7	5	33.3	6	40.0

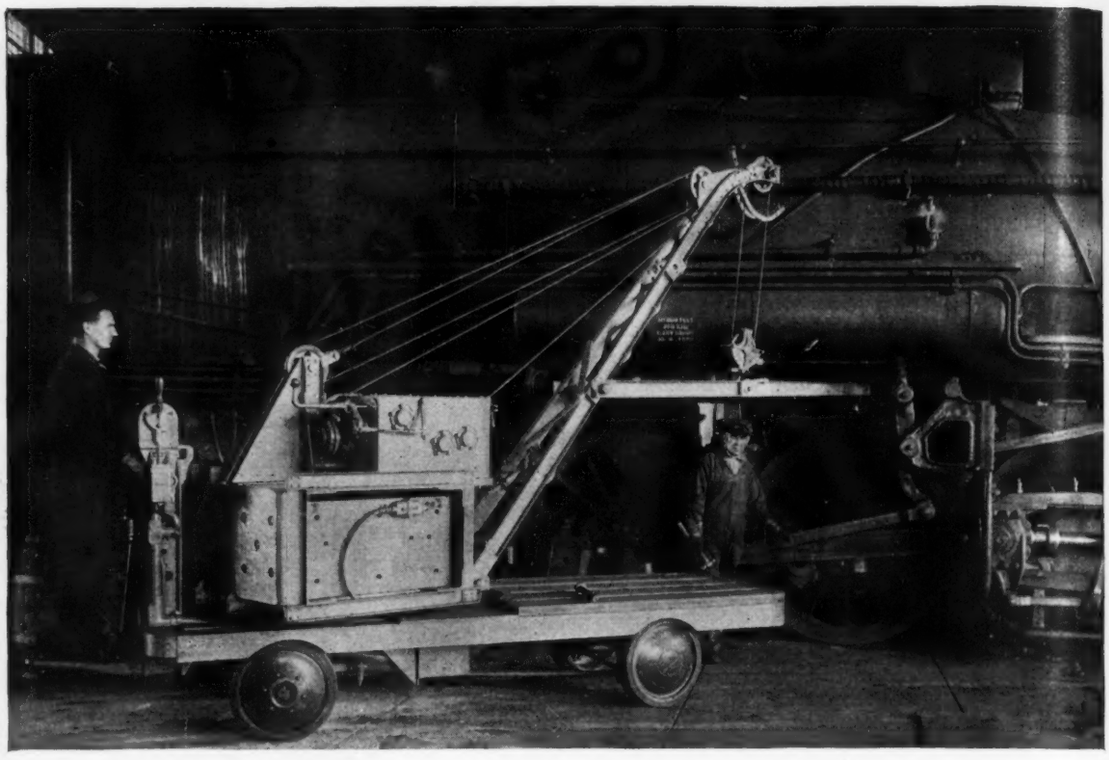
The principal weakness of the pitch method is the ridge of untreated wood that grows under the strip of bark left to sustain growth in the tree. All the poles examined in the test reported upon were attacked by fungi at this untreated ridge.

Conduit Pusher Cuts Time to 1/15 of Jacking Method

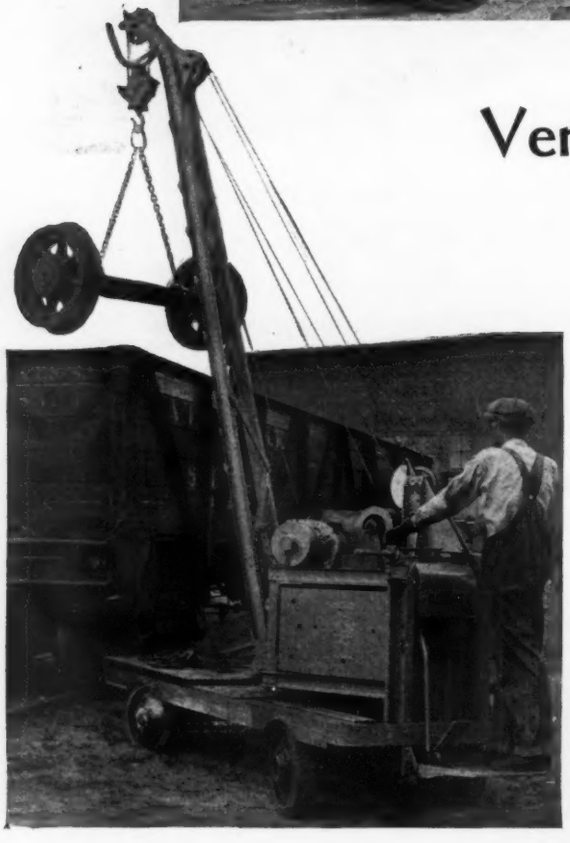
By R. J. DRAKE
Assistant Street Lighting Engineer
Public Service Company of Northern Illinois

A VERY efficient machine was developed by the A. A. Electric Company and used on a street-lighting installation at Berwyn, Ill., for pushing conduit under paved and other surfaces that could not be disturbed. This machine is an adaptation of the Fordson tractor. As may be seen from the accompanying illustration the equipment consists of a mandrel frame which is hung from a short boom mounted on the tractor. The mandrel travels in the frame, being carried along by a cable and pulley arrangement which multiplies the force supplied from the tractor. The cables are carried out to two drums, mounted on the front of the tractor, which are connected to the power take-off by means of a slip clutch common to both winches.

In operation a hole 7 ft. long and 2½ ft. deep is dug and into this is lowered the mandrel frame. Power is applied to the lower winch, which, reeling up the cable, forces the mandrel forward. After the section of conduit is pushed the top winch operates the mandrel carrier in a reverse direction so that a new grip on the conduit may be taken. If an obstacle such as a rock is encountered the carrier stalls and the driving winch slips its clutch. Under normal conditions the clutch is adjusted to slip at about 14,000 lb. pressure on the conduit. This machine has pushed 35 ft. of 2-in. conduit through ordinary soil in eight minutes. The total cost of the machine, exclusive of the tractor, was $2,500.



Versatile Railroad Servants



LONG used in platform service, industrial electric trucks have been developed rapidly to meet the heavy demands of locomotive repair shop and yard material transport. The modern crane-type truck is a highly mobile unit designed safely to render fast service in every plant when handling cumbrous material of inconvenient length or shape. By its use on a planned basis after engineering analysis of local conditions rolling stock is returned to the line more speedily, men are released for other tasks and maintenance costs cut.

Betterment Expenditures NOW Will Maintain Prosperity

Some industrial conditions that need attention to increase production economy on which industrialists and utilities can jointly concentrate to advantage

THE National Business Survey Committee, which grew out of the Hoover conferences, has made its first tangible step toward stabilization of business. This step has been to ask the co-operation of every trade and industry association in ascertaining the economic possibilities in their respective industries for participating in a nation-wide program of repairs, replacements and betterments. Besides, all the trade organizations have been asked to urge their members to undertake immediately all repairs, replacements and betterments that have to be made some time anyway.

There is a tremendous amount of industrial rehabilitation work which could be undertaken profitably from the viewpoint of the industrial organizations involved. Most industrial organizations have enjoyed a period of material prosperity. Their earnings have been satisfactory and they have built up adequate surplus and reserve accounts. Therefore, they are in a splendid position to undertake the job of tuning up their mechanical and electrical equipment so as to realize better economy on future operations.

A few opportunities that exist involve:

Odd Voltage, Phase and Frequency Installations.—Many industrial plants still retain antiquated electrical systems, differing in voltage, phase and frequency from the standards of the utility company in their territory. Such plants are under a constant handicap, so far as repair and replacement expense and the first cost of additions are concerned. They are likewise subjected to delay in securing spare parts and repair material.

Included in this group is a large number of installations using 500-volt d.c. equipment. The danger of grounds and the hazard to personnel in handling such equipment should be carefully reviewed and considered.

Inadequate Plant and Building Wiring.—The wiring in most industrial plants and commercial establishments is pitifully inadequate. Some of the resultant evils are:

(a) Fire risk.

(b) Poor regulation, affecting lighting efficiency and motor speeds.

(c) Inflexibility of control.

(d) Interruptions, due to overloaded circuits and the operation of protective equipment.

Electric distribution systems in factories have "just growed like Topsy," with little regard to losses, voltage drop, economical use of copper, provisions for extensions or changes, shifting of machinery, availability for repair, etc.

Many installations have been built up piecemeal, with the result that there are several different service entrances to the same premises. In rectifying such conditions industrial and commercial establishments would probably secure additional benefit from a lower rate if their purchases of service were taken at one location.

In office and commercial buildings electrical distribution can also be improved frequently. High-voltage vertical distribution is a new move in tall buildings and should receive more widespread consideration.

Poor Power and Load Factor Costly.—Most utilities are rapidly adopting some feature in their rate schedules to stimulate an interest on the part of the industrial customer in power-factor correction, so that action at this time would place industrials immediately in a position to take advantage of any such power factor inducements when they are offered, if not in force at the present time.

Processes requiring heavy power demands should be arranged in such sequence as to increase the load factor. Such arrangement reduces the cost of the power per unit of product and has been taken advantage of by the modern factory in many cases.

Improved Machinery for Production.—Judging from the backwardness of some industries in electrifying, they have overlooked the value of a thorough study of motorization benefits. But even some highly electrified plants have improperly applied control apparatus that is preventing best utilization of electric power and apparently have not investigated the greater ease of operation

and reduced maintenance costs available by substituting automatic for manual control. In many cases the rearrangement of equipment, permitted with electric operation, will improve working conditions and production.

The use of the best tools which can be obtained for production should be coupled with the use of electricity for motive power. Modern tools driven by electric motors are a necessity if the factory is to keep abreast of the times.

Material-Handling Facilities.—Modern material-handling devices are necessary in the factory to speed up production and reduce the time required for transportation of raw material and finished products from one department to another. Electric cranes, industrial trucks, conveyor belts, gravity conveying tables and modern elevators afford a variety of useful applications.

Industrial Heating Applications.—As pointed out in the January 18 issue of ELECTRICAL WORLD the industrial customers of just fifteen utilities have seen fit to use electric heat for industrial processes to the extent of nearly 1,000,000,000 kw.-hr. in 1928 and the usage has increased 104 per cent in four years. On this basis it is calculated that 6,000,000,000 kw.-hr. was used for such processes throughout the United States in 1929. One large manufacturer of electrical equipment estimates that there are now 500,000 kw. in resistance type furnaces, 250,000 kw. in industrial ovens and 500,000 kw. in miscellaneous applications. The resistance furnaces are used for vitreous enameling, forging, ceramic firing, heat treating and annealing. This manufacturer's specialists estimate that 52,000,000 kw. of such applications are economical now, and the ELECTRICAL WORLD calculated in 1926 that the consumption should attain 93,427,000,000 kw.-hr. if all economical applications then available are made.

Unsatisfactory Lighting Systems.—The advantages of better lighting in the factory and commercial establishment are almost self-evident, but many industries have not yet taken advantage of better lighting in order to decrease spoilage, increase production and preserve the eyesight of the workers. The field in this respect is almost unlimited.

Inefficient Steam Heating Systems.—One of the greatest sources of waste in industrial and commercial undertakings lies in the inefficient use of steam for heating. This applies with equal force whether steam is required for industrial processes or only building heating. A heating survey of most industrial plants would be distinctly profitable to the managements for it would indicate many places where steam is being used for heating when better results could be obtained by gas, electricity or oil. Such a study would disclose many situations where condensate is being wasted to sewers instead of being piped back to the boiler room. The possibilities for economies in this direction are startling.

Air Conditioning Aids Business and Production. — By necessity, textile mills have used conditioned air, and theaters have found it advantageous for increasing patronage. Other factories, and buildings in which many people congregate or work will find benefits in conditioning the air, as some hotels, department stores and the like are beginning to realize. Provision of a proper working atmosphere is becoming recognized as highly important for increasing production as well as preserving the health of workers.

Hazardous Equipment.—In the press of industrial activity, many hazards have grown up and it might be appropriate for industrial concerns, in co-operation with utilities, to study conditions with a view toward correcting dangerous situations. Some of these hazards are fire and explosion hazards, while others are personal hazards. Reference is made to such things as dangerously located and improperly designed substations. Cranes and other material-handling equipment used indoors or outside may develop hazards not only to the life of employees, but to the continuity of electric service supply.

Better housekeeping would greatly help in removing these hazards. Greater attention to such minor items as cleaning windows, lighting equipment and the prompt removal and disposal of refuse would likewise be beneficial.

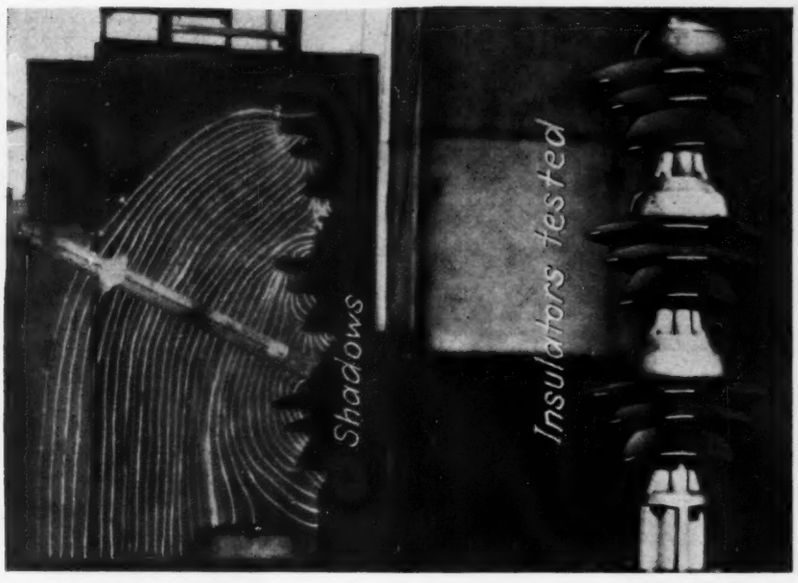
Consulting Service.—Power salesmen of utilities can be utilized as consultants on many subjects. These men through their contacts and information available to them can help industrial customers greatly. Their literature on new methods or processes is also helpful.

Lighting engineers are quite generally employed by utilities to recommend to industrials ways in which they can obtain the greatest amount of illumination per kilowatt-hour used. This is a type of service which can be profitably utilized.

Advising Proper Rate Schedule.—By following closely the monthly bills of industrial customers to make sure that they are operating on the proper power schedule and advising them when they can operate to better advantage on some other schedule, some utilities have established confidences which lead to mutual advantages. In some cases this practice has made a marked reduction in some customers' costs per kilowatt-hour and reduced the utility's revenue, but it convinces customers that the utility is watching their interests.

Economic Studies.—When the situation warrants it, some utility companies make reports containing estimated costs on electrifying and completely rearranging production equipment. In one case a shoe factory which was equipped to produce 400 dozen pairs a day but whose volume had dropped approximately 75 per cent was greatly assisted by the utility submitting detailed plans for completely rearranging the factory to produce one hundred dozen pairs. In this report plans were submitted for electrifying it and putting the plant on a modern basis so the manufacturer could compete in the open market. From that time on this manufacturer forged ahead and more than doubled his capacity.

These few practices just indicate the opportunities for co-operation between utilities and industrialists in modernizing their plants so they can utilize the seasonal slump that occurs each year to benefit the remainder of 1930, as well as in the future. More important still is the fact that such work, if started now, will serve to maintain the buying power of industries' best customer —American labor. The advantages to be derived by industrialists and utilities from such betterments, replacements and repairs will be more keenly felt than ever before, but realization will depend on action NOW.



Use of straw indicator and silhouette drawing. Field intensity measured with neon tube

Measuring Dielectric Fields

By M. R. MULHOTRA

Westinghouse Electric & Manufacturing Company

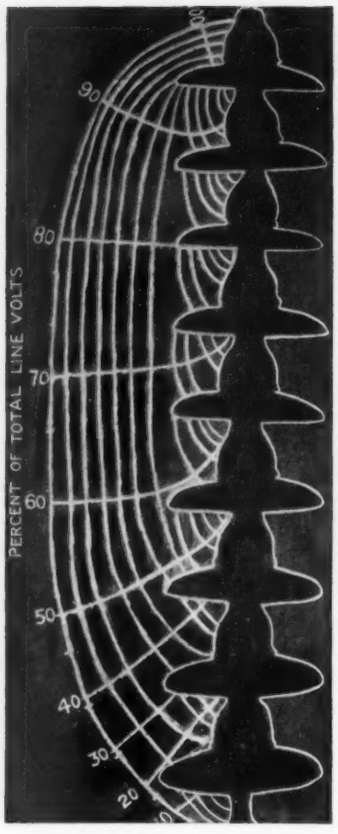
IT HAS long been known that a condition of electric stress exists adjacent to charged conductors. Faraday assumed that tubes or lines of strain existed in the medium and Maxwell gave these tubes a quantitative significance. However, except for simple electrodes such as spheres, theoretical analyses of the Faraday lines become difficult. In fact, for insulating members as used in practice, the dielectric field in the surrounding air is quite complicated in form, but its importance cannot be overestimated, since the flashover voltage is a direct function of the field distribution. Heretofore, most methods for determining field direction and intensity required the use of a dielectric other than air or the insertion in the field of objects which naturally changed conditions for that region. The method* discussed below seems to be the most satisfactory development to date.

Just as a magnetic member will align itself longitudinally in the magnetic field in which it is placed, a cellulose fiber will give the direction of the dielectric field for the position at which it is located. Hence, a hollow, non-pithy, lightweight straw, approximately $\frac{1}{8}$ in. diameter by 1 in. long, is mounted on a small wire shaft inserted through its center. Mechanical balance and little friction are of prime importance for quick and accurate response. The shaft is suspended by means of strings in such a position that the straw lies in the plane of the insulator studied. By locating the straw in successive positions between one electrode and the other the line of stress may be followed quite accurately.

The simplest means of recording the field is by making a silhouette. The shadow of the insulator and the indicating straw are thrown upon a large sheet of paper or a blackboard. Then the shadow of the straw is traced as it is moved from position to position throughout the field.

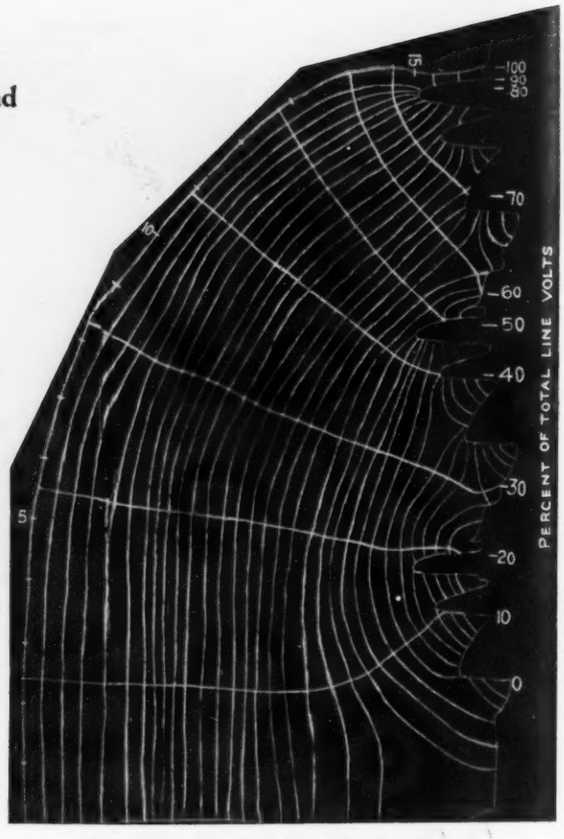
Field intensity is determined by means of a neon tube

*"*Mitteilungen der Hermsdorf Schomburg," Heft 19, 1925, page 535*



Dielectric fields around nine- and three-unit insulators

About 20 per cent of line voltage is impressed across line unit at left; about 30 per cent at right



with small wire electrodes, for which the voltage where a glow appears is constant. The tube is suspended in the field coincident with a section of a line of stress as previously determined by the straw. The voltage required on the insulator to just cause the tube to glow is then determined. Successive readings are taken by moving the tube along the flux line one tube length at a time, until the complete line of stress has been traversed. In this way the voltage distribution along this particular line is obtained. Experimental readings are transferred readily to a per cent-of-total-impressed-voltage basis.

In this manner the intensity distribution along several lines of stress may be determined. From these the equipotential lines can be drawn. However, a distribution curve on one or two flux lines is usually sufficient, since the equipotential lines always cut the stress lines at right angles. By extending the equipotential lines to the insulator the voltage distribution along its surface is obtained.

The results of the field determination on the three-unit stack of pillar insulators are shown above. It is seen that 40 per cent of the total voltage appears across the line unit, with 30 per cent on each of the others.

Tests on a nine-unit string of 5½-in. spaced 10-in. diameter suspension insulators gave the results illustrated. In this case nearly 20 per cent of the voltage appears on each of the two units nearest the line. This indicates that there is considerable room for improvement in the voltage distribution on long plain strings.

Field studies are of more significance in connection with such apparatus as bushings and lightning arrester gaps, where the nature of the field can be readily controlled either by the design of the elements or by additional grading devices. However, the above results serve to indicate the possibilities of dielectric field determination following this or related procedures.

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Flashes from Attwill's Forge*

"I am inclined to question the desirability of granting the commission the power to regulate holding companies as to their operation or their further consolidation. Such regulation implies a certain responsibility for them. . . . It might be well to force all securities of holding companies to be registered under the "blue sky" act. I cannot see any purpose in attempting to regulate holding companies as though they were public utilities, but it might be well to make contracts between holding companies and their subsidiaries subject to commission approval before they become effective. . . .

"I am not an advocate of public ownership if the private companies will do the right thing for us, and am disinclined to a regulative contract between the companies and the state if the situation can be met in any other way. I doubt the wisdom of having a commission regulate company borrowings. . . . I do not like to see the public do anything that it can get some one else to do reasonably and efficiently."

**From a statement by the Hon. Henry C. Attwill, chairman Massachusetts Department of Public Utilities, before the special legislative committee on public utility control.*

Budgeting Reduces Operating Ratio

By F. B. LEWIS

Vice-President and Assistant General Manager
Southern California Edison Company, Los Angeles, Calif.

THE plan of budgeting operating expenses inaugurated by the Southern California Edison Company in 1924 has not only reduced operating expenses but also has produced greater harmony and co-operation within the organization and between departments. What has been accomplished by the writer's company is best illustrated by the fact that the ratio of operating expense (not including taxes or fuel) to gross revenue in 1923 was 28.6 per cent and in 1928 had been reduced to 20.6 per cent. This in spite of material reductions in rates which were made during the period in question and which, of course, reduced gross revenue.

The operating budget is prepared by making a very careful study of the operating expenses of each department and subdivision thereof. These studies are made in conjunction with the superintendent, station chief or district manager and are not arbitrarily set by a higher officer. When agreed upon, the studies become the operating budget, and the superintendent, station chief or district manager understands that they are expected to operate without exceeding their expense budgets so fixed.

In a similar manner, studies are made of revenue that can reasonably be expected from the various classes of business in each district or division. In the operating department budgets covering both operation and maintenance expenses are adopted for each and every division; viz., steam generation, hydro generation, substation, transmission, distribution, communication and meter. In the commercial department the budget covers all commercial expenses, such as meter reading, collecting, bookkeeping, etc., for each district office.

The operating budget is split in accordance with the California Railroad Commission's classification of accounts and each station chief or division head is allowed a given sum of money, by accounts and by months, to carry on his particular operation. Curves or graphs of their costs are made up by the various station chiefs and division heads, by months, so that each is in a position to know at all times how he stands in relation to his budget.

To illustrate the effectiveness of the control of expenditures so that the actual expenses for the year shall not materially exceed the budget allowances, and to show how close the actual accomplishments are to the estimates which make up the operating budget, it will be seen from the accompanying table that for the year 1928 actual expenditures were missed only 0.32 per cent out of a total operating cost of $6,055,000.

Comparison of Actual Operating Expenses with Budgeted Figures

Showing how remarkably close operating costs may be controlled by the operating budget plan.

	1928 Budget	1928 Actual	Difference in per Cent
New business contracted) (in horsepower)	291,000	293,000	0.68 over
Gross revenue	$33,500,000	$34,516,000	3.03 over
Commercial expense	1,693,000	1,660,000	1.95 under
Production expense	1,300,000	1,299,000	0.1 under
Transmission expense	839,000	861,000	2.6 over
Distribution expense	1,804,000	1,802,000	0.1 under
Utilization expense	323,000	321,000	0.6 under
Communication expense	115,000	112,000	2.6 under
Total expense	$6,074,000	$6,055,000	0.32 under

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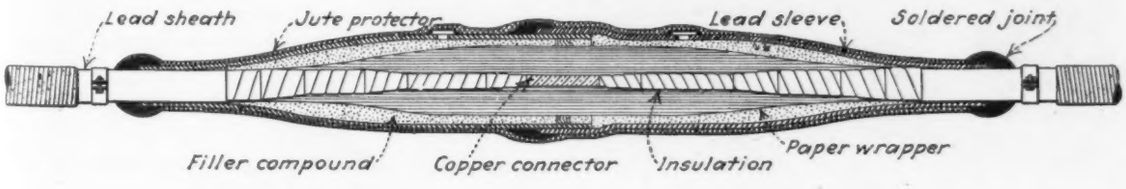
Dry Air Under Pressure Makes Sound 50-Kv. Joints

A HYDRO-ELECTRIC power station located in a zone of snow avalanches, in Switzerland, faced the difficult problem of carrying the output of its four 28,000-kva. waterwheel generators 3½ miles down to the valley. A tunnel was blasted through the solid rock and contains lead-sheathed cables, sufficient to carry the entire output of the generators. To avoid excessive losses and minimize the copper cross-section the potential of each three-phase generator is raised by a transformer to 50 kv., the cables being designed to operate at $50/\sqrt{3}$ kv. A total of twelve single-conductor cables, three per generator, are provided.

To increase the reliability of these high-tension cables as much as possible the paper insulation was carefully graded, so that nearest the copper core cable paper of highest dielectric strength was used, tapering off in strength in five steps toward the sheath. According to the description in the November 22, 1929, *Bulletin de l'Association Suisse des Electriciens,* the cable tunnel has room for a small narrow gage storage battery locomotive,

CABLE JOINT SPECIALLY DEVISED FOR DAMP INSTALLATIONS (50 KV.)



which simplifies inspection and affords transportation from station to the valley. Between the rails of this road runs a brook, the water of which is deviated at frequent intervals, to wet the sand in which the twelve cables are buried. This keeps the cables cool and helps heat dissipation. The heavy cables could not be manufactured in more than 3,000-ft. lengths, so that a great many splices are located in the tunnel.

The splicing of 50-kv. cable in the moist atmosphere of a long tunnel was another problem to be faced. A satisfactory solution was found by surrounding the splice length of the cable with a partial cylinder, into which a portable electric air compressor fed carefully dried air, keeping the winding space within the cylinder at about 1½ lb. per square inch pressure. A heating unit at the bottom of the cylinder kept the temperature within the cylinder at a considerably higher value than the tunnel ambient. The finished cable transmission line was tested for one hour with 110-kv. direct current. Measurements under full load of 310 amp. indicated that these cables have a loss of 27.7 kw. in the copper and 8.0 kw. in the lead sheath per kilometer length.

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Light and Speedy Portable Meter Test Set

By W. L. CARR
Supervisor of Electric Metering
New York Power & Light Corporation, Albany, N. Y.

SPECIAL attention was devoted to the minimization of weight and to the arrangement of load steps in order that the portable watt-hour meter test set for field use on the New York Power & Light system might be as satisfactory as possible. A well-known manufacturer of phantom load boxes remodeled one of the extremely light-weight type in accordance with our suggestions.

The phantom load box has primary connections for either 115 or 230 volts. The secondary leads consist of three; one to the common terminal of the test meter (with the watt-hour meter in series), one to the coil of the test meter used for the "light load" readings and one to the coil of the test meter used for the "full load" readings, with a tumbler type of switch mounted on the phantom load box closing the circuit through the "light load" coil or "full load" coil, depending on its position. There are two light load steps of fixed resistance; one of ¼ amp. and one of ½ amp. rating.

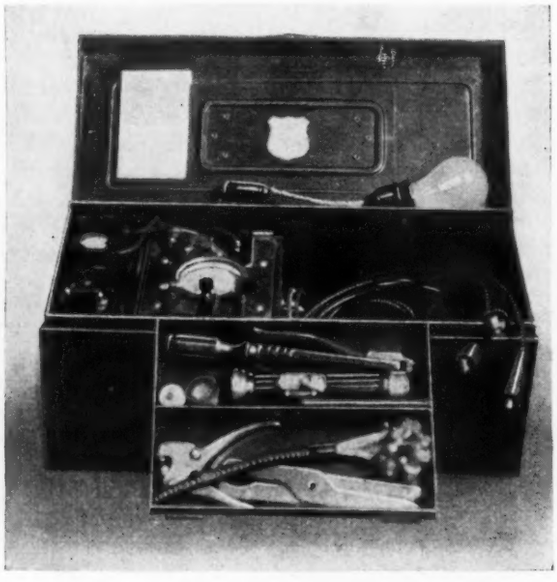
The heavier loads for the normal and full load steps are obtained through an adjustable carbon pile, the current being read on a small indicating ammeter mounted in the phantom load casing. The ammeter has two coils, both in the full load circuit; one has a 20-amp. scale, but as this is difficult to read on the lower portion of the scale a 5-amp. coil is connected in circuit by holding down a push button, giving a full scale reading of 5 amp., thus permitting loads between 1 and 5 amp. to be obtained. Loads of 5 to 20 amp. are read on the higher scale.

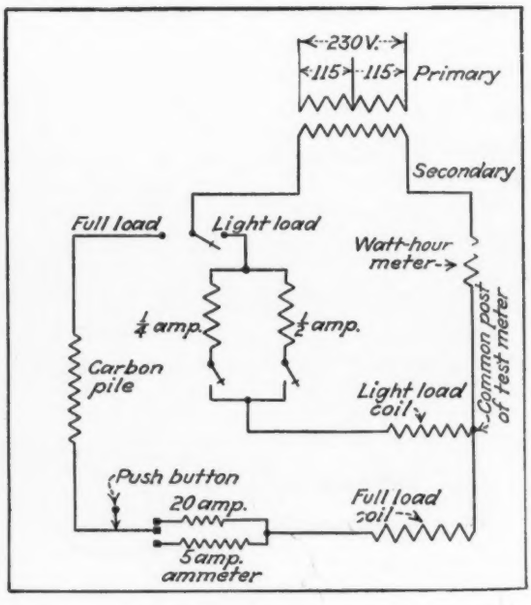
The outfit consists of a metal-carrying case, 19x8x9 in. (stock type), to contain all the test equipment and tools. The test leads between the test meter and phantom load are left intact within the case; the leads to connect to the watt-hour meter are very flexible, have a high grade rubber insulation and have clip contacts to be attached at the meter or test block.

The outfit is well liked by the testers and the number of meters tested per day is materially increased in districts that have one or two meters per building, the condition found in residential sections of the majority of towns and cities. At least two additional meters per day are tested using this outfit as compared with one where the test meter and loading device were carried as separate units and the load steps slower to obtain.

The outfit complete weighs approximately 24 lb. and is suitable for testing meters up to 25 amp. capacity.

PORTABLE SET OFFERS EXTREME LIGHTNESS AND SIMPLICITY





No need for conflict between trees and wires

Trimming Trees Without Offending Nature Lovers

By F. A. BARTLETT

President F. A. Bartlett Tree Expert Company

DURING the past few years the private tree expert companies have recognized the need for molding their work to the standards of scientific research. Tree research laboratories have been established where the problems of tree growth, disease, insect attack and physiological disturbances have been studied and results incorporated in the work which is being carried on to preserve and perpetuate shade tree growth.

And, now, wherein lies the scientific viewpoint, or better yet, how does science embody its precepts in the apparently non-technical process of "cutting a limb off" in line clearance?

Let us follow a crew of "dendricians"* during the course of one working day of a line clearance program. We are on a typical city residential street where the limb, twig and leaf growth of American elm, silver, rock and Norway maple, linden and sycamore has turned and interlaced about the overhead systems so that current outages have become too frequent, radio reception has been annoyingly disrupted and the continuity of electrical distribution seriously impaired.

From the viewpoint of the utility adequate clearance must be secured. From the viewpoint of the practical dendrician clearance must be secured by proper pruning. From the viewpoint of science clearance must be secured by proper pruning considered on the basis of such as the relative brittleness of different species of trees, water content, sap flow, structural strength, rapidity of heal after pruning, susceptibility of wood to weathering, "checking" and rotting, and countless other factors.

The dendrician coils his rope, throws it over a crotch high in the tree and pulls himself up to the point where he may centralize his pruning work. Science has prohibited the use of spurs in climbing because each hole, however small, made by the ripping, tearing spur point would leave an opening for the entrance of harmful diseases. The dendrician by virtue of his training knows that the use of spurs on "thin-skinned" trees, such as silver maple, is extremely dangerous.

His pruning operations, simple in scope to the un-

*Term used to indicate persons trained in tree culture.

ALTHOUGH tree trimming is resorted to by utilities only when essential to prevent interruptions of service or extensive overbuilding or detours, considerable public resistance is frequently encountered. Two major reasons for this situation seem to exist:

(1) Some companies or their right-of-way representatives do not take the trouble to explain to objectors how trees may affect the continuity of service, and to a certain extent cost of service. (2) Either no attempt is made to preserve the beauty of trees trimmed or the company does not impress the objectors with the fact they are respecting their love of nature by employing experts in tree culture.

trained eye of the lay observer, are all carried on with a purpose based on scientific fact. The physiological structure and time of sap flow in such trees as maple and ash govern the extent of "heading in" which may be accomplished with these particular trees. The angle at which the pruning cut is made must be carefully calculated. It must neither be so acute as to throw new growth into the wires nor so horizontal as to form a receptive area for the collection of moisture. The ultimate growth of the tree must be definitely decided and this is governed by the scientific principles of cellular multiplication.

I hereby grant the.....Co. permission to do such trimming on my trees as they deem necessary to clear the wires of the..... .....at no expense to me. It is understood by both parties herein concerned that such trimming is necessary to prevent interruptions of service by leakage of electricity or breaking of wires by trees and branches.

Date

NAME.....

ADDRESS.....

Public good-will will be strengthened by securing trimming permission

Different trees present varying problems in such phases of public utility clearance as shaping. Preserving the symmetrical natural top of the tree while removing impeding growth is a task. For instance, "sweeping" the tops of maples results in no malformation; the tree soon regains its natural contour (on a reduced scale, of course), but the American elm would be sadly marred by any solid cutting across its top. The limb growth of the elm is indeed peculiar, and "staggered" pruning, involving the cutting of key limbs, must be the program if the top is to be lowered without destroying the graceful vase-like shape.

Pruning on elms, oaks and other "high-headed" trees must be carried on, in most cases, to lift the ultimate tree growth definitely above the wires, while on the "low-headed" trees, such as Norway maple, Oriental plane, etc., pruning is based on the ultimate growth of the trees below the wires.

In any program of line clearance the dendrician brings his scientific training to bear on the problem to the benefit of the municipality, the latter term being used in its sense of a communal group of tree lovers who are users of electricity. Besides obtaining the permission of the property owner to trim, he is ready to give any immediate suggestion as to the condition or needs of the tree. In this way he is doing much to strengthen the good will between the utility and the customer. When the program of clearance is covered with systems used by such organizations as the Wayne County, Michigan, Board of Road Commissioners and the clearance itself is being carried out by dendricians trained in the principles of tree growth the element of public good will is doubly protected.

Also, and this is particularly true in the Eastern states, municipal tree wardens are devoting more of their time to the science of tree care. Building up an active and aggressive good will between the tree warden and the utility depends entirely on the only factor by which the former may gage the worth and safety of utility clearance—is it based on correct scientific principles? The tree warden is, and righly so, a sovereign where the treatment of town or city trees is concerned. Where the utility is concerned only with hasty trimming at any horticultural cost will be found a decided antipathy toward clearance activities; where the utility not only is sincere in its desire to co-operate with a, sane type of clearance but goes one step further and places at the disposal of tree wardens the facilities of modern science, little opposition will be encountered to balk necessary tree trimming for lessening of service interference.

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To Our Salesmen:

Never try to sell anything you don't believe in yourself. If you have not the firm conviction in your own mind that what you are trying to sell will benefit the customer, you do the customer and yourself an injury if you try to put it over.

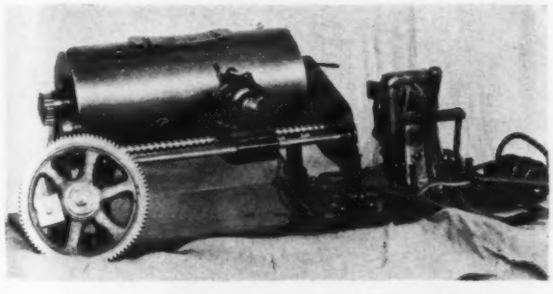
P. S. ARKWRIGHT,
President Georgia Power Company.

Timing Opening of Breaker Contacts

By H. T. SUTCLIFFE
Assistant Engineer Pacific Gas & Electric Company

IN CARRYING out routine tests special methods or apparatus are sometimes advantageous to save time or secure results that would be difficult to obtain otherwise. For example, a number of 110-kv. and 220-kv. breakers on this system utilize high-speed arcing contacts which require periodic adjustments to insure satisfactory and simultaneous operation. It was found that the action of these contacts in air, with the breaker manually operated, was not a reliable index to their operation under service conditions. Accordingly a device was developed for testing and recording the relative travel of these arcing contacts before parting and the position at which they parted, with the breaker full of oil and operated electrically.

Briefly, this device, which is shown in an accompanying illustration, consists of a drum driven through a gear and pinion by the operation of the breaker mechanism. On the drum are placed two blank letter-sized sheets of paper with a carbon paper between them. The drum revolves about three-quarters of a turn while the switch is traveling from full closed to full open position, or vice versa, the record being drawn by a stylus which is normally held against the drum by a spring, but withdrawn from contact by the energizing of a solenoid. It can be held away by means of a latch when changing charts, etc. In order to prevent overlapping of the records left by the stylus during successive operations its solenoid is moved across the face of the chart by a ratchet screw driven from the drum, moving approximately ¼ in. to the right for each operation.

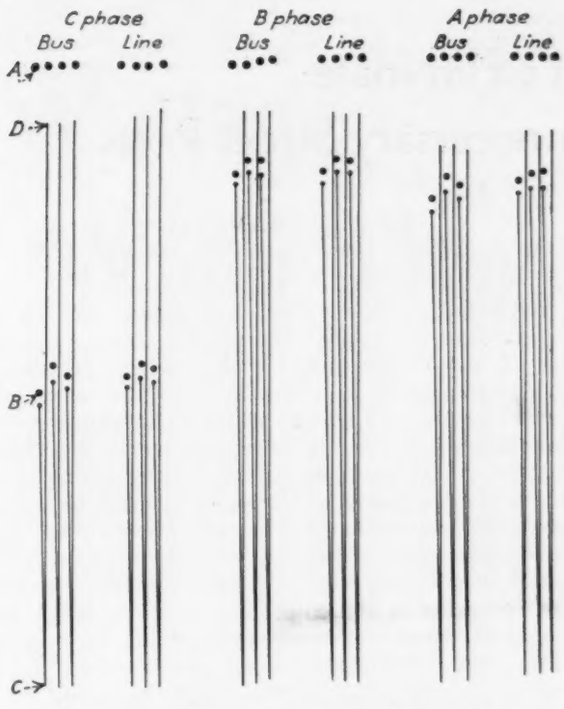


Stylus indicates whether breaker contacts open simultaneously

In addition there has been provided a single-pole, double-throw switch for operating the circuit breaker electrically during the test, a main control switch for de-energizing the test equipment, a small relay used to operate a cycle counter when actual operating time is required and suitable leads for making connection to the control source at the breaker operating mechanism. All of the parts are mounted on a base supported by a bracket bolted to the breaker tested.

The driving gear is bolted and keyed to the end of the semaphore shaft. Connection is made to the cross-head in one tank of the breaker by means of a spring clip which is tapped and mounted on the end of a wood rod. This is lowered into the switch and the clip slipped over the cross-head, after which the rod is unscrewed and withdrawn. A lead attached to the clip is brought to the test device and another lead is carried from one or the other of the terminal bushings, depending on which arcing contact is under test. The arcing contact is thus connected in series with the solenoid controlling the stylus, so that when the contact parts the stylus is released and makes a mark on the moving paper corresponding to the position of the breaker mechanism when the parting occurs.

The above reproduction of an actual chart, shows the resulting record. This record supplies information which could not be obtained otherwise. It is invaluable in making the necessary adjustments and can be filed for future reference.



Timing device chart indicating delay in opening of individual phase contacts

The dots at *A* are made by opening the control switch momentarily in order to check the full closed position of the breaker. As the breaker is tripped and travels from the closed toward the open position a point *B* is reached, at which the arcing contact under test parts, resulting in the large dot shown. A slight rebounding of the stylus explains the smaller following dot and the record is then continued as a line until the full open position is reached at *C*. As the breaker is then closed, the line is continued back to *D*, at which point the circuit breaker contact again closes. Full closed position is reached and checked again at *A*. It will be noted that three tests are taken for checking purposes on each contact in the breaker. From the chart shown it was determined that the contacts in *A* and *B* phase tanks were opening prematurely, while the contacts on *C* phase were opening quite satisfactorily and practically together.

Let's Eliminate Unnecessary Street Posts

By J. R. CRAVATH
Consulting Illuminating Engineer, San Francisco, Calif.

IT HAS been many years since power and signal system wires have gone underground on the principal streets of our largest cities; trolley wires, of course, being the exception. As far as overhead wires are concerned the air has been cleared on such thoroughfares. Nothwithstanding this, it appears that only eternal vigilance can keep such streets from being cluttered up unnecessarily by posts or standards of various kinds. These various posts usually all represent important public improvements. We would not be without the services for which they were erected. However, there is a woeful lack of co-operation and co-ordination in the design and execution of street improvements involving the erection of posts, and the worst offenders are likely to be the very ones who years ago had the most to say about clearing the streets of overhead wires, namely, the municipal authorities and city planners.

On one corner of a street intersection in a Western city there are five posts or standards of various kinds, not including fire hydrants. But for the unfortunate fact that co-operation had gone far enough in this case so that the lighting standards and trolley poles had been combined in a most pleasing way (so much so in fact that this street has a national reputation for its lighting), there would have been six posts at this corner. In this particular case the chief offender was the city government. Traffic signals, street names, fire alarm boxes, etc., are all set up as if belonging to separate and hostile interests instead of different branches or bureaus of one city government. There is nothing exceptional about this situation. It is cited merely as a striking concrete example.

Such a multiplicity of posts at each corner is of course unnecessary and absurd. It is confusing to strangers, unsightly and unnecessarily expensive. The remedy lies in a co-operative spirit and a determination on the part of all concerned to plan ahead and keep the street as clear as possible.

Complications of joint ownership and selfish motives furnish the reasons for non-co-operation in a thing of this kind. In many cases it is easier for those promoting a project to spend more of other people's money and put up independent posts than to go through the negotiations and planning to consolidate. Manufacturers of street-lighting equipment often are most active promoters of new projects. As these interests receive more gross business out of a street-lighting job than any others it naturally follows that they can afford to spend more to make a sale than any others.

Some of our post manufacturers realize that in the long run their interests will be best served by having a few well-designed posts on a street rather than a multiplicity of small poles of motley appearance and are putting forth creditable effort to bring that about. Nevertheless, the tendencies in the past have quite naturally been for the post salesman to endeavor to get as much iron or concrete on the street as possible and avoid the complications and delay and possible loss of the job by attempting to bring all parties together in the interest of simplification.

Considering the number of elements that are working to make the course of least resistance lead to an unnecessary multiplicity of posts in our streets, it should be evident that this course of least resistance can be changed only by a determination on the part of all concerned to work toward simplicity rather than toward multiplicity.

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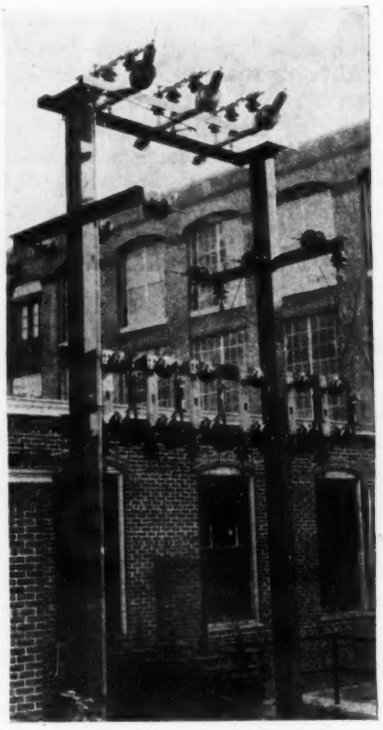
Industrial Substation Fits Unused Corner

IN A Massachusetts factory where space is at a premium on account of a passing roadway, a small stream and an irregular lot, an industrial substation for receiving and transforming purchased power was built at a corner of the mill overlooking the waterway. Standard structural steel columns and angles were employed, with reinforced concrete column foundations and a platform of the latter material for transformer mounting. Simple angles and channels without bracing carry the insulators and airbreak switches for the incoming line, the short high-tension bus and also the fuses above the transformers. The economy of material resulting from this simplicity of structural design is apparent.



Industrial substation made of standard structural steel

Low vs. High Wattage Water Heater

By HARRY A. WILLIAMS

Engineer Hynes & Cox Electric Corporation

CONSIDERABLE controversy has occurred regarding the merits and demerits of the high-wattage, small-storage and low-wattage, large-storage types of electric water heaters and many arguments have been presented for each type. It is, however, generally agreed that to give satisfactory service to the user a heater must possess the following characteristics:

1. The load characteristics and demand must be such that the utility can supply electric current at a cost comparable with other fuels.
2. The heater must have reasonably rapid recuperation.
3. The storage capacity must be sufficient to care for the greatest single draw of water desired.
4. The cost of the heater plus the cost of installation must be within the limits that the customer is willing to pay.
5. The installation should be free from control devices which restrict the supply of hot water or which may fail in service.

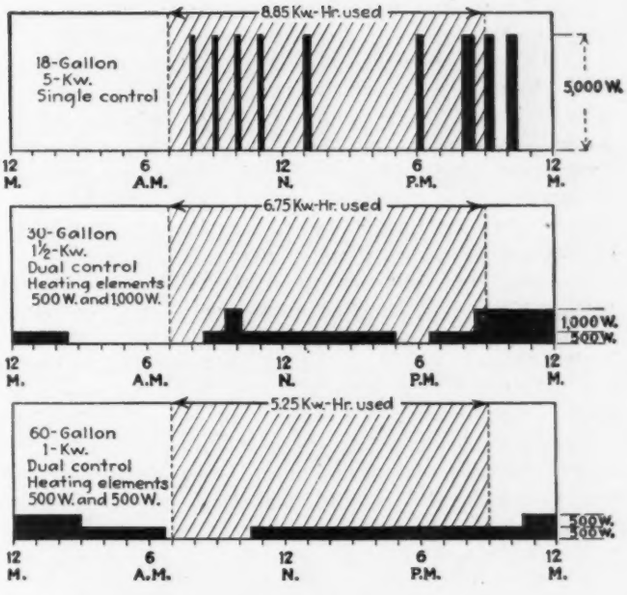
One of the principal advantages of the low-wattage heater is that it gives a large proportion of night-time load. This is particularly the case where more than one heating element is used, since the upper element will cut off when the heater is partly full of hot water, leaving the lower element to complete the heating. Due to the necessarily rapid recuperation of a small capacity tank equipped with a high-wattage heating element the recuperation is accomplished within an hour from the time of drawing water. This eliminates the possibility of night-time load.

The accompanying chart shows the comparative loads obtained from various types of water heaters. By adding up the components of each load we find that the electrical energy used during the on-peak period is as follows:

Gal.	Kw.	Control	Kw.-Hr.
18	5	Single	8.85
30	1½	Dual	6.75
60	1	Dual	5.25

In addition to the large amount of night-time use the low-wattage heater does not require a large increase in the capacity of the service transformers or heavier wiring from the transformer to the house.

The high-wattage, small-capacity heater appeals to the small user of hot water. This is a stumbling block, since the small use of current results in a very high proportion of fixed charges against the heater and the amount of current consumed and paid for will not be great enough to absorb these fixed charges. It follows, therefore, that this small user must be served either at a higher rate or else at a loss.



Comparative demands of different type water heaters

The shaded portion represents the average period of utility peak load. The black portion represents the intensity and duration of the heater load.

Cold water supply 50 deg. F.
Heated water temperature 150 deg. F.
Average daily use of hot water per family, 50 gal.
Average consumption of hot water as follows:

		Per Cent	Gal.
Morning	(7:30 to 10:30 a.m.) 3½ gal. drawn at 7:30, 8:30, 9:30 and 10:30 a.m.	30	equals 15
Noon	(12 to 1 p.m.) 2½ gal. drawn at 12 noon and 1 p.m.	10	equals 5
Early evening	(5 to 7 p.m.) 2½ gal. drawn at 5, 6 and 7 p.m.	15	equals 7½
Evening	(8 to 10 p.m.) 7½ gal. drawn at 8, 9 and 10 p.m.	45	equals 22½
		100	50

In the high-wattage, small-capacity type of water heater there is no advantage in dividing the heating element into two or more circuits, since a draw-off of 10 gal. of hot water will bring all the stages of heat on practically simultaneously. With the low-wattage, large-capacity heater the use of more than one heating element is a decided advantage, since draws of 10 gal. of water will not cause the upper element to be cut on and the recuperation will be accomplished by means of the lower element only. In case a large enough draw has been made to cause both elements to cut on the upper one will cut off when the tank is partly heated, leaving the lower element to finish the heating. This gives a prolonged load and is largely responsible for the large proportion of night-time load obtainable with a low-wattage heater. Naturally, a heater consuming a large proportion of night-time load merits a lower rate on account of the smaller share of fixed charges chargeable against it.

The low-wattage heater has proved its position as a load builder and as one which can be served at a low price. Under ideal conditions high wattage may give a good load factor, but experience has shown that when these conditions change the utility is saddled with a lot of heaters which must be served at a loss unless it is possible to increase the rates, with the consequent difficulties and customer dissatisfaction.

In rural communities the distribution network and service transformers are comparatively light and usually are not capable of handling the heavy loads imposed by high-wattage equipment. If it is necessary to replace the network and transformers in order to serve these heaters the investment is prohibitive. On the other hand, low-wattage heaters (1 to 1½ kw.) can usually be connected on without any change. It has been the writer's experience that the 30-gal. capacity rated at 1½ kw. will serve from 90 to 95 per cent of the families using electric water heaters.

Many electric water heaters are not sold to new homes, but to homes where electric wiring has been installed for some time. Low-wattage heaters can usually be connected onto these lines without change, but high-wattage heaters frequently require a heavier service entrance. The cost of these changes will often prevent the sale of a water heater if the customer is required to pay them. If the utility absorbs these charges they must be paid for through a higher rate.

The use of high-wattage heaters frequently requires the installation of a doublt-throw switch between the range and the water heater in order to prevent excessive loading of the service transformer, etc., and the use of such a switch often prevents rapid recuperation of a small-capacity tank at times when rapid recuperation is most necessary. One of the principal objections to the small tank is that the hot water supply will fail sooner when large draws of hot water are required, and if immediate recuperation is not possible the customer will be without hot water. Large storage capacity (30 to 60 gal.) eliminates this necessity of rapid recuperation and provides an ample reserve of hot water to draw on. Where low wattage is used in conjunction with large storage capacity recuperation can take place at any time, since load-limiting devices are not necessary.

Experience of others

The ELECTRICAL WORLD recently published the James H. McGraw prize paper "The Electric Water Heater," by H. Geo. D. Nutting. In this paper Mr. Nutting ably points out the advantages derived from the use of low-wattage equipment and gives figures to show that low-wattage heaters can be profitably served at a low rate without increasing the investment in substations and distribution network, with the possible exception of increase in the capacity of service transformers.

He further points out that high-wattage heaters have the disadvantage that it is usually necessary to increase the size of the entrance switch, which usually costs about $50, so that the over-all cost of the heater installation is somewhat increased over the cost of the 1-kw. installation, which will usually not exceed $10. In this connection Mr. Nutting does not mention the additional cost

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The Unknown Toilers

ONLY in the last great war do we find a tendency to look beyond the Generals, to the front line trenches, where we find the unknown soldiers whom the world has enshrined in its heart as symbolic of the work and life of the common soldier in the ranks.

I think science needs to recognize in somewhat the same way the unknown toilers in our laboratories and shops, who, without any special recognition, add item by item to the inventions, until the first crude expression of an invention becomes the perfect, completed, useful article of every-day life. But we need not erect literal monuments to the unknown contributors to the electrical art, because their monuments are all about us.

Without the innumerable contributions of unknown men not a single modern art would be of much practical value today. In other words, the contributions of the many, unknown though they may be, are more important, in my mind, than the contributions of the few, which are so well known.

A. W. ROBERTSON,
Chairman Westinghouse Electric & Manufacturing Company

of service transformers when serving 5-kw. heaters, but this is an item which will further increase the cost.

Toward the end of the paper Mr. Nutting maintains that if it is feasible to prevent washday from coming on the system peak that the diversity factor of 5-kw. water heaters can be close to 5 to 1. How close the diversity can be to this figure is not known, but basing calculations on the ideal 5 to 1 diversity he shows that the cost to serve a 5-kw. heater even under these conditions is over 25 per cent greater than to serve a 1-kw. heater which is operating under ordinary conditions.

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Two Aids to Better Welding

ONE baffling problem in electric welding has been to find some way of reducing the time required to recover full open-circuit voltage after a short circuit. The quicker this recovery the more nearly will voltage changes in the machine follow the voltage changes of the arc. The net result is an easier operating arc, which means more work with less fatigue and effort.

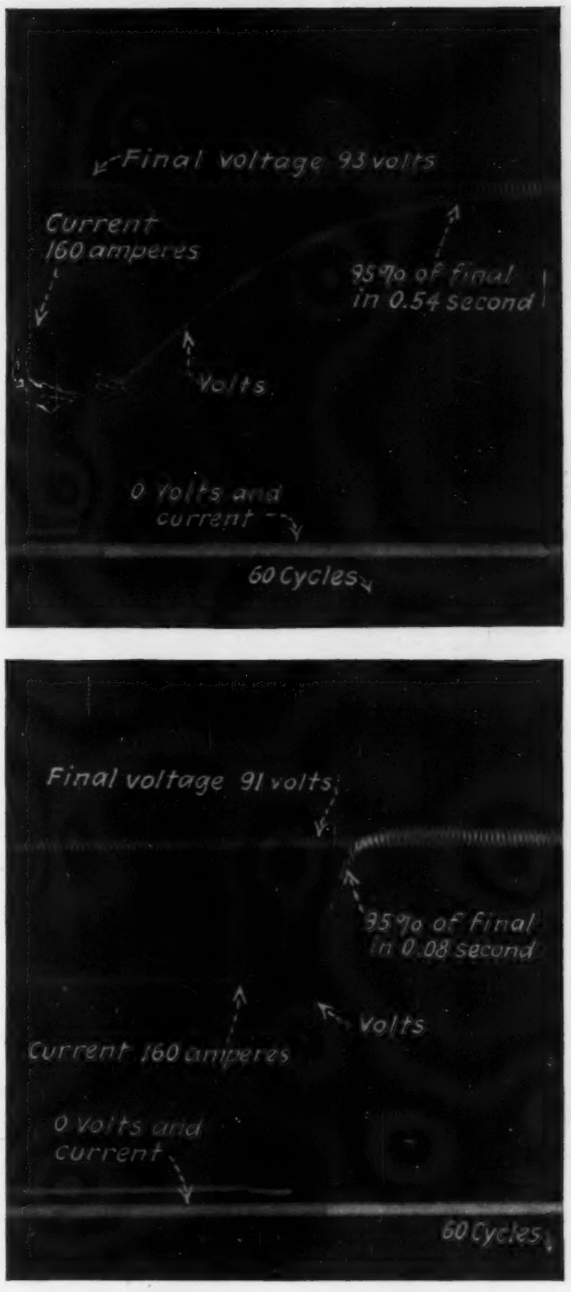
The research laboratories of the Lincoln Electric Company, Cleveland, Ohio, began work on this problem in 1924 and reports that a commercial solution will be available in the not too distant future.

In all single-operator welding machines now on the market, the Lincoln company points out, there must be some method of reducing the open-circuit voltage of the machine to the varying voltage demanded by the arc. This may be accomplished by utilizing armature reaction, varying series field or any one of a dozen or so other methods. In effect, however, the results are similar, one magnetic field of some kind opposes another. When two magnetic fields are in proximity the well-known transformer action occurs. As a result, a welding machine will not ordinarily adjust itself to the changes in the voltage of the arc as quickly as it could if the internal transformer action were eliminated.

To illustrate, consider the upper oscillogram, which shows the time required for the voltage to recover from zero or short-circuit value to 95 per cent of the final voltage in one of the standard machines now on the market. If the transformer effect which retards this recovery can be nullified inside of the machine the result would be materially better.

Experiments have shown the possibility of inserting in the arc circuit a device which will produce effects similar to those produced in the machine by the transformer action of the double winding on the pole pieces, except that the effect will be in the opposite direction, thus nullifying the original transformer action. The lower oscillogram shows the results. It will be noted that the length of time for the voltage to rise from zero or short-circuit value to 95 per cent of its final voltage is very much reduced.

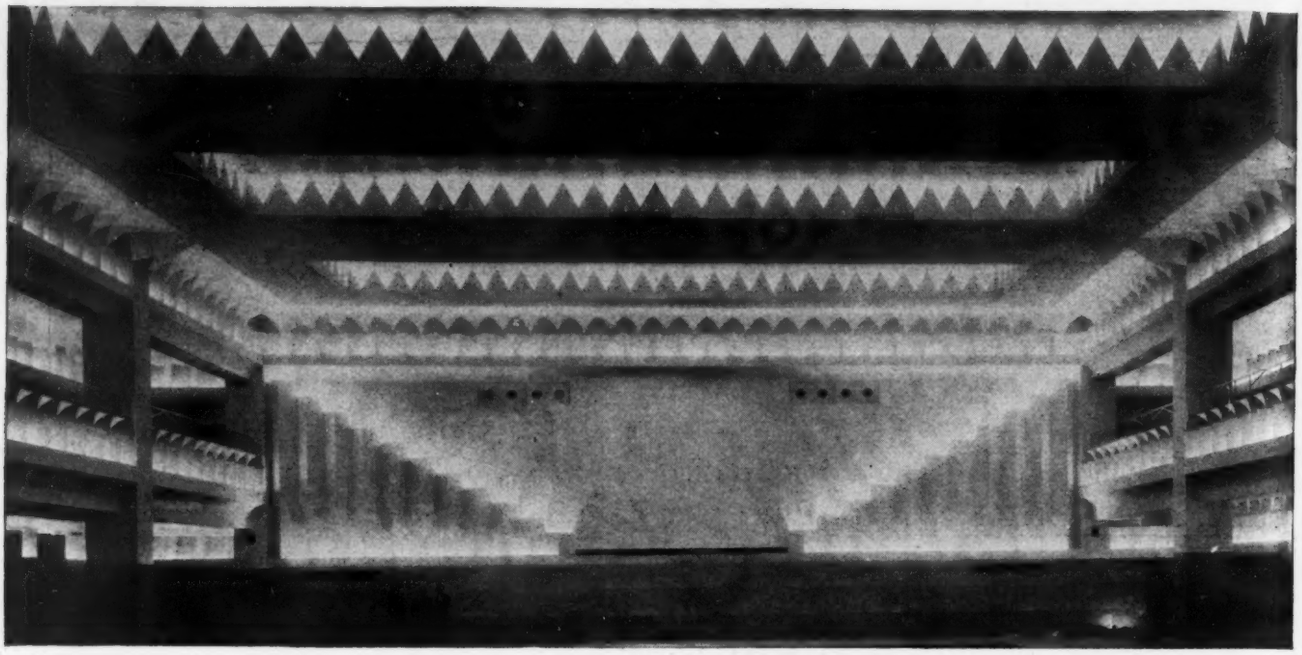
Ordinarily when a welding machine is short circuited the instantaneous short-circuit current will immediately rise to a considerable higher value than is desired for the best welding operation. In ordinary welding with the metallic arc the machine is being short circuited intermittently from perhaps 15 to 30 times per second by globules of molten metal touching both the electrode and the work. These peaks of current occurring at short circuit cause considerable higher heat loss in these molten globules than is desirable, causing the globules to boil or explode. The welding operator calls this "spatter."



Voltage-recovery time reduced from 0.54 to 0.08 second by new welding machine

By nullification of the transformer effect the overshooting of the current at the time of making a short circuit is reduced and, experiments show, made almost zero.

The deductions drawn are the result of an exhaustive study of arc characteristics, conducted over a period of years.

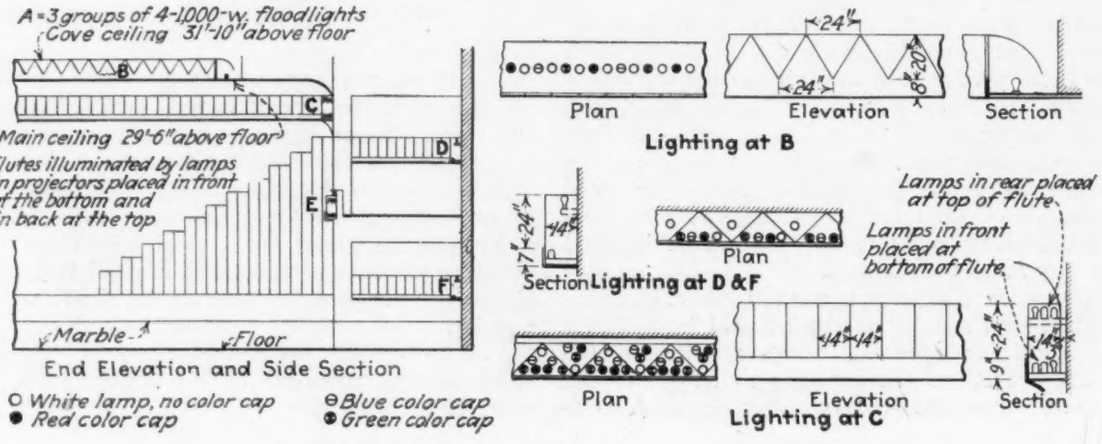


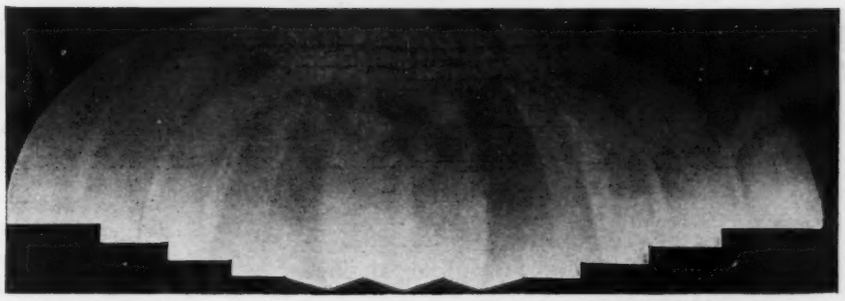
COLOR LIGHTING
Becomes Interior Decoration

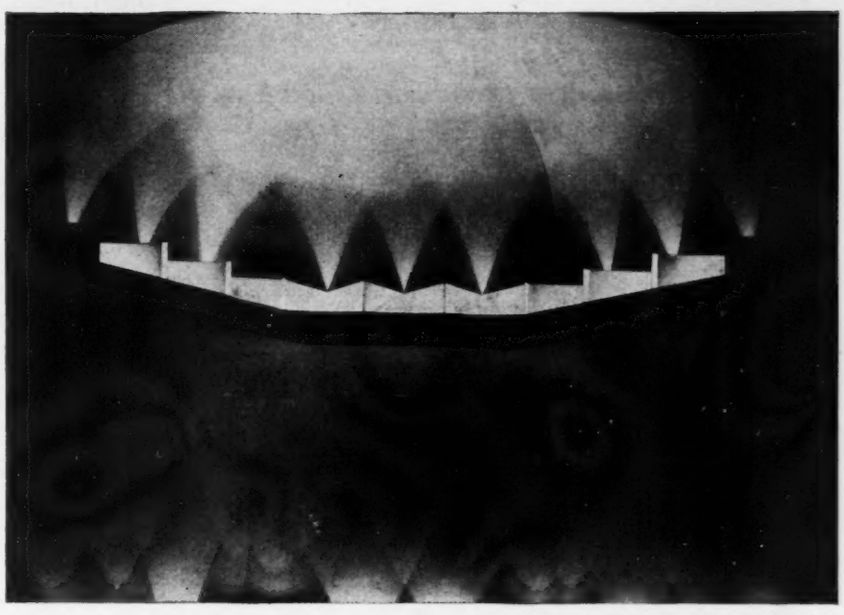
PROMISE of a wholly new lighting art is the ambitious possibility of the installation in the recently opened ballroom of the St. George Hotel, Brooklyn, N. Y. Interiors of assembly rooms, offices, homes and theaters are susceptible to this treatment. Exteriors of buildings may likewise be painted with light.

Plain walls, devoid of windows or any visible ceiling or wall fixtures and finished in flat white, supply the surface upon which colors and geometric motifs may be formed. It is estimated that 100,000 variations are possible in the illuminating effects. Green, blue, white, amber, red, brown, alone, in combination, in waves, in spot concentration, dull or bright, may be secured at the touch of the operator, whosé remote-control board becomes a center of color symphonies. As sources, only white, red, green and blue are used.

HOW RELIEF EFFECT IN LIGHTING WAS SECURED





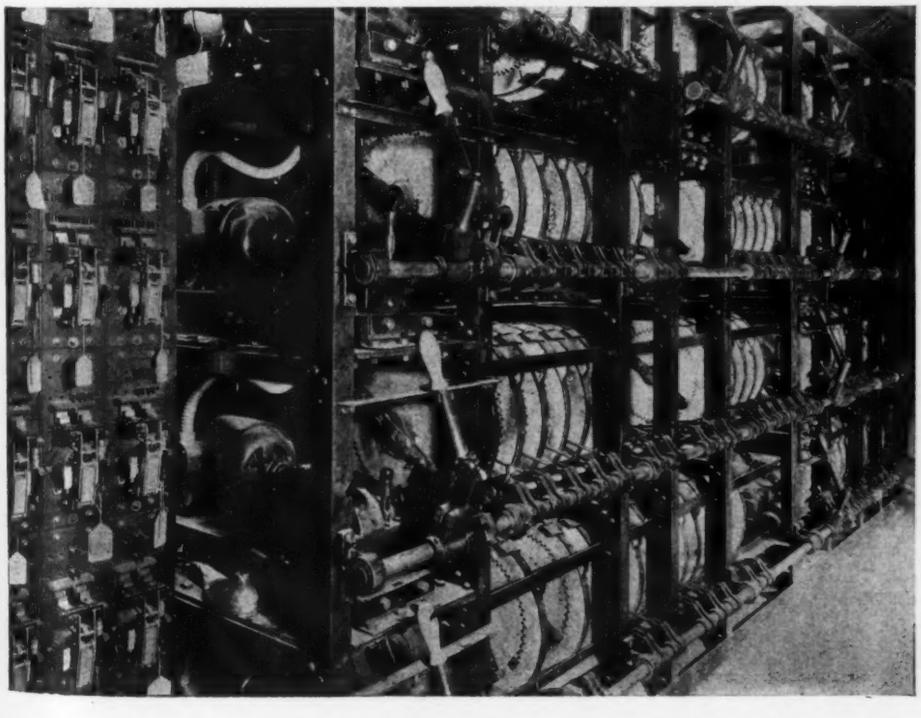


Demonstration alcove indicates geometry of effects obtainable

More than 6,000 lamps, ranging from 50 to 1,000 watts, total 630,000 watts. Watts per square foot average 57. Control is effected from a panel with more than 500 buttons; 190 dimmer plates are required. One man, by remote control, may operate the whole installation.

"Painting with Light" is said to be less expensive than good hand-decorated walls of the conventional sort, but $150,000 was expended on the installation for the St. George ballroom.

F. J. Cadenas, illuminating engineer National Lamp Works, developed and experimented with this unusual and startling innovation in the lighting art in collaboration with Winold Reiss, architect, and Messrs. Samuels and Messner of Bing & Bing, owners of the St. George Hotel. The ballroom is said to be one of the largest in the world, having an unobstructed floor area of 9,500 sq.ft. Heating engineers saved approximately 3,000 sq.ft. of steam-heating radiation owing to the heat generated by the lights.



Motor-driven dimmers control intensities and rate of color changes

Better Bond Market Predicted for 1930

Recent strengthening in prices of high-grade bonds is expected to continue and expand during the current year

By C. W. SILLS
Vice-President Halsey, Stuart & Company

EARLY resumption of activity in the bond market appears to be a foregone conclusion. The theory that common stocks had permanently displaced sound bonds as an investment medium with the great mass of conservative investors is now shown to be as fallacious a belief as many of the other economic and financial theories that characterized the recent speculative boom, and which, indeed, are an inevitable accompaniment of overdone speculative enthusiasm whenever and wherever it appears. The value of sound senior obligations, paying a fixed and regular rate of income, is again firmly established. It is only a question of time until the advantages of investment over speculation again receive their due and just recognition in the securities markets of the country.

The present status of the bond market can perhaps best be understood through a review of what has taken place in that field during 1929. The inactivity and tendency toward softening of prices which carried over from the second half of 1928 persisted into 1929, and became more pronounced with the increase in speculative activity. Only during the last two months of the past year has there been a perceptible strengthening in the prices of high-grade bonds and an increasing interest in the long-neglected short-term class.

Supply of high-grade issues was not great in 1929

The supply of high-grade bonds has not been great at any time during the year. The total volume of bonds and notes issued during 1929 did in all probability not greatly exceed $4,300,000,000, which is approximately 23 per cent under the total for 1928, and about 21 per cent below the average for the five years from 1924 to 1928. Because of the high cost of money and the sluggishness of the market throughout the greater part of the year, dealers have not been encouraged to carry any very substantial inventories. Undigested issues of important size are virtually non-existent. Liquidation by banks has for some time been quite well out of the way. Furthermore, there has been a considerable retirement of bonds during the past year, which has also operated to reduce the available supply. Finally, liquidation of bonds during the recent stock market crisis did not develop to anything like the extent that might have been expected.

Consequently, the unabsorbed supply of bonds in the market is small, and there appears to be little disposition among corporations to add to the supply through further offerings until their senior securities will command materially higher prices than those now prevailing on comparable issues. In view of this situation, any material improvement in the demand for bonds would undoubtedly have a marked strengthening effect upon the prices of those available.

The total volume of public utility obligations offered during 1929 will run in the neighborhood of $1,000,000,000, a total which compares with $1,654,343,900 during 1928. This class of investments has been among the first to respond to the recent upturn in the price of high-grade bonds. The leading public utility companies of the country, having availed themselves of the recent popularity of stocks to build up their junior equities, are admirably situated to accomplish such bond financing as may be necessary to meet their requirements for the future. Although a good volume of such financing is in prospect, there is little likelihood that it will be carried through on an extensive scale until there is a material further improvement in the prices prevailing on this class of securities.

More optimism warranted for immediate future

The present situation and outlook in the bond market justifies more optimism than at any time during the past year and a half. Speculation, which occupied the center of the stage throughout the greater part of that time, rose to such heights that it interfered very greatly with the investment market and with numerous forms of business development which required capital at moderate cost. Since October, 1929, the first long step has been taken toward restoring true investment to its proper place in the financial scheme of things. That the purchase of bonds by banks is again under way is indicated by the fact that the reporting member banks of the Federal Reserve System have in recent weeks shown a substantial increase in their bond holdings. Various factors in the financial situation have so far prevented anything like full recovery in the bond market. Such strength as has appeared has not to any great extent taken away the numerous opportunities for obtaining sound security and liberal income in either short or long term bonds. To illustrate the values still prevailing among different types of bonds, we need only compare the levels prevailing in recent weeks with those in the early months of 1928. A group of 30 representative issues, comprising ten each from the public utility, industrial and railroad groups, showed average prices of 102.69, 100.57 and 100.85, respectively, as of March 2, 1928. On December 2, 1929, the averages for these groups were as follows: Public utilities, 96.31; industrials, 90.70; railroads, 95.53. In other words, the public utility bonds were 6.38 points cheaper at the beginning of December, 1929, than they were at the beginning of March last year; the industrials, 9.87 points cheaper; and the railroads, 5.32 points cheaper.

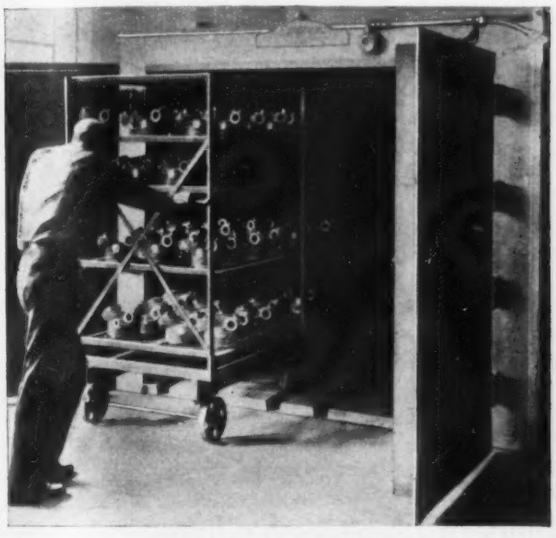
Clearly, we are still in an exceptionally favorable period from the standpoint of the bond investor. With the major obstruction to progress definitely removed, and with an excellent outlook for a period of easier money, there is much justification for the view that the coming year will see a definite resumption of activity in the bond market.

Electric Ovens for High Quality Heat Treating

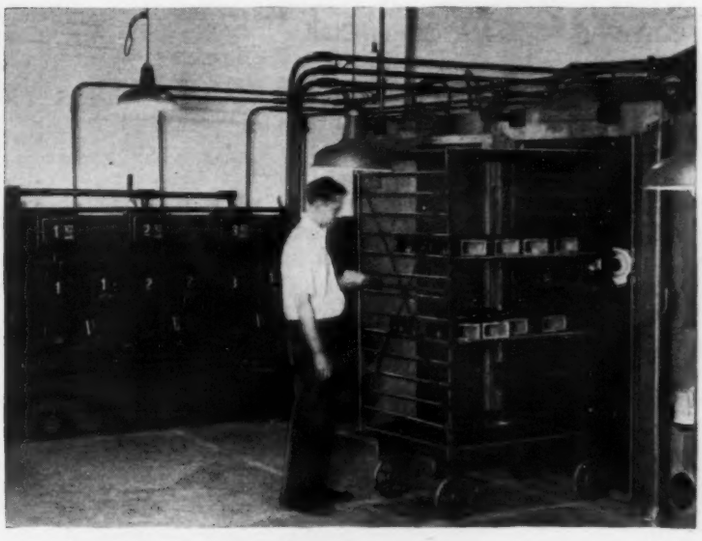
FOUR electric ovens are used in the foundry and machine shop of the Wright Aeronautical Corporation at Paterson, N. J., for work requiring particularly uniform heat distribution or accurate temperature control. Because of the low gradient heat supplied by electricity the heat in these ovens is very evenly distributed.

After the castings are made it is necessary to reheat them to remove strains and also to age them to improve their tensile strength. This is accomplished in a truck-loading oven, 9x9x7 ft., which handles two cars per heat. This oven has a connected load of 60 kw., is provided with automatic temperature control and designed for a range of 200-700 deg. F. A specially designed circulating system provides uniform heat distribution.

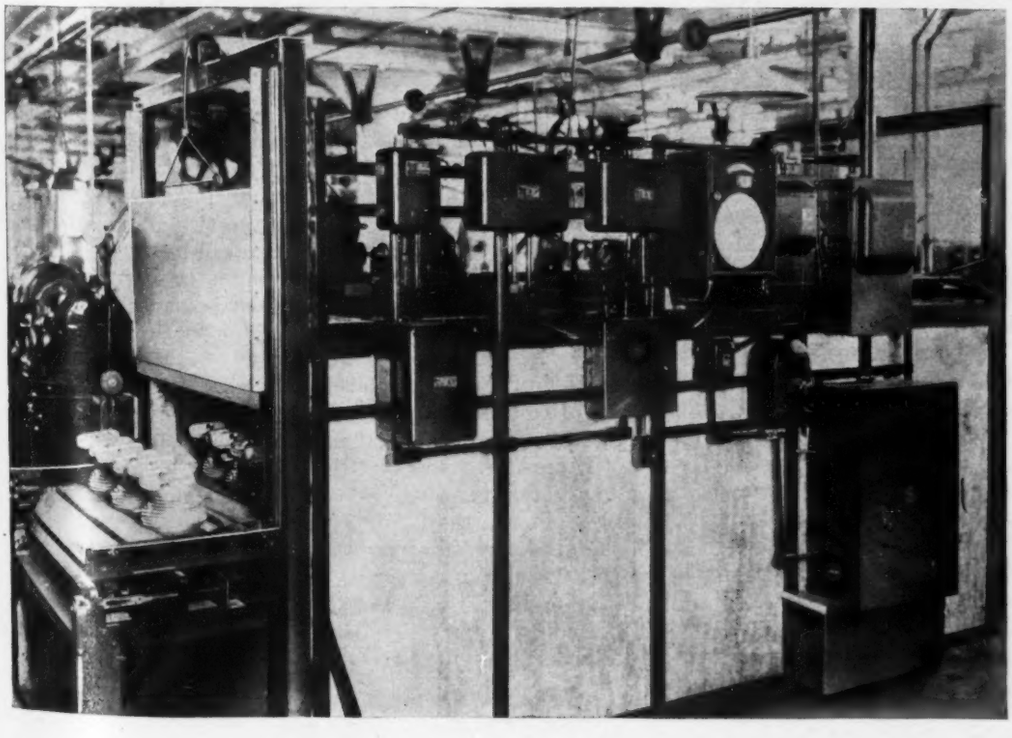
In the machine shop a continuous conveyor electric oven is used for expanding the cylinder head uniformly at 750 deg. F. prior to shrinking it onto the steel cylinder. The equipment is automatic in its operation in that the operator at his station, at the unloading end, by a series of push buttons may open or close the lift door at either end of the oven or cause the conveyor to progress. The heating is entirely automatic with automatic recording temperature control.



Airplane motor castings must be thoroughly annealed



Enameled surfaces require controlled baking



Full automatic temperature control for pre-shrink heating of cylinder heads

After the cylinder heads are shrunk on the cylinder they are japanned and baked in electrically heated truck-loading ovens. Crank cases and other gray enamel finished parts are baked in a three-compartment electric oven. All the ovens in the Wright plant were designed, built and installed by the Gehnrich Oven Company of Long Island City, N. Y.

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READERS' FORUM

Grounding and Short Circuiting Transmission Line Circuits

To the Editor of the ELECTRICAL WORLD:

I was much interested in the article appearing in the ELECTRICAL WORLD for October 19, 1929, entitled "Installing Grounding Chains on Pole Lines."

Several years ago the writer had occasion to investigate a fatal accident which occurred in connection with work on a transmission line which had been cut out of service and grounded by a chain of the same type as that specified in the article referred to. The line in question was paralleled by another line which was in operation and the workman apparently received a static shock which startled him sufficiently so that he threw out his arms to preserve his balance. One arm came close enough to a 22-kv. bus so that an arc was established. The man was severely burned and in addition was thrown from the structure to the ground, thereby causing his death.

Following the accident the investigation showed that the ground chains were apparently properly installed, and in view of the man's past careful record it was very difficult to understand the apparent carelessness which caused the accident. During the course of the investigation, however, the engineer making the investigation touched one of the conductors of the grounded circuit and received this static shock.

This, of course, was sufficient to raise a question regarding the effectiveness of the ground chain. Measurements of the resistance of the station ground to which the ground chain was attached proved the ground resistance to be under 2 ohms. The difficulty, therefore, seemed to be between the connection to the station ground and the transmission line. A 115-volt transformer was immediately connected between the transmission line and the station ground with an ammeter in circuit, and upon closing the circuit it was found impossible to pass any current whatsoever through the circuit formed by the transformer, grounding conductor, ground chain and a few feet of transmission line. The voltage was then stepped up to 230 volts and a similar test applied, with the ammeters showing only a very slight indication of current. Although the ground chain was pulled tight the engineer then shook the chain somewhat and was astonished to see a display of sparks at every joint in the chain. Following the shaking of the chain the ammeter showed about 5 amp. of current flowing in the circuit.

The chain in use was a comparatively new one and while the non-conducting deposits on the chain would probably have been broken down by the application of a higher potential with any power behind it, the serious results of its failure to drain a small static charge was so apparent that the use of ground chains for any purpose other than the preliminary short circuiting of a line was immediately ordered discontinued. Present practice calls for the short circuiting of the transmission line and grounding it by means of the ground chain as a preliminary measure, after which the line is effectively grounded by means of a standard spring or screw clamp permanently attached to a flexible copper conductor.

In removing the grounding device the reverse order is observed and the clamps removed before the ground chain is removed.

Since that time the writer has discussed this subject in a number of N.E.L.A. committee meetings and has learned of other cases where the same result has been obtained from a ground chain. In most cases where this has been discussed the practice recommended by the writer has been adopted. While the cost of the operation is somewhat more, the effectiveness of the ground and the resulting safety to the workmen is sufficient to warrant the expenditure. The writer wishes to recommend its serious consideration by all those charged with responsibility for the safety of their employees.

H. A. HOLMES,
Manager Power Department.
Monongahela West Penn Public Service Company.
Fairmont, W. Va.

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Possibility of Effecting Savings with Higher Voltage Generators

To the Editor of the ELECTRICAL WORLD:

In the article on high-voltage generators by Parsons and Rosen, in the issue of November 9, it would seem that an item of considerable importance has been neglected that might seriously reduce the savings to be effected by the omission of transformers.

As the comparison of costs starts at the generator terminals, the authors have assumed identical efficiency curves for the two machines. Of two parallel designs the lower voltage machine would probably have a somewhat higher efficiency. This might be corrected by a more expensive design, but if the allowance of $50,000, or 53 cents per kilovolt-ampere, for the increase in cost of the higher voltage generators is adequate, it is logical to assume that the efficiency of the low-voltage design might be brought up to offset the transformer losses at a cost considerably less than 53 cents per kilovolt-ampere.

It is to be noted that the major part of the estimated annual saving is based on eliminating losses of the order of three-fourths of 1 per cent, or less, so that even a slightly lower efficiency for the higher voltage generator, at a point on the curve corresponding to the average load to be carried, would wholly, or in part, wipe out the difference in losses between the two systems, and thus the corresponding saving.

C. G. KILBOURNE,
Electrical Engineer.
Thomas E. Murray, Inc.,
New York City.

Men of the Industry

J. S. Jenks Chief Engineer West Penn Electric

J. S. JENKS, who has been intimately associated with the affairs of the West Penn organization for almost thirty years, has been elected vice-president and chief engineer of the West Penn

Electric Company. Mr. Jenks' connection with West Penn dates from its earliest days, to be exact from the summer of 1902. By successive steps he has filled positions of increasing importance in the company's service. At first he occupied the position of transmission engineer and his first duty was to build the 25,000-volt transmission system. For ten years he was active in problems involving right of way and the engineering, construction and operation of transmission lines, substations and power stations.

In 1912 he was transferred from Connellsville to Pittsburgh as assistant to W. E. Moore, then general manager, and in 1914 had supervision of all activities relating to power service from the time power left the generating station until it reached the customer. When A. M. Lynn took charge of the properties in 1916, Mr. Jenks was again placed in charge of operation of power stations and three years later he was elected vice-president of West Penn Power Company. In his new position Mr. Jenks will act as chief engineer of all the electric properties and serve also as the company's contract man with Sanderson & Porter.

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WARREN PARTRIDGE, a vice-president and trustee of the New England Gas & Electric Association, has been elected a vice-president and a director of the New Bedford Gas & Electric Company, recently acquired by the Associated Gas & Electric Company. DAVID A. BEAMAN will continue as general manager of the New Bedford company. FRANCIS E. FROTHINGHAM of Coffin & Burr, Boston, has resigned as a director of the New Bedford utility.

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A. DEAN DUDLEY, since 1918 treasurer and assistant secretary of the Syracuse Lighting Company, Inc., was recently elected vice-president of that company. Mr. Dudley, who has been connected with the Syracuse organization since 1907, was formerly with the United Gas Improvement Company in Philadelphia. After five years' service with that company in promotional and investigation work, Mr. Dudley went to Syracuse when the U.G.I. interests took over the Syracuse properties. In May, 1907, he was appointed commercial agent and retained this position until January, 1918, when he became treasurer and assistant-secretary of the Syracuse company.

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THEODORE SWAN, who has been named president of Swan Research, Inc., just formed by the Swan Corporation, has been an active figure in the development of Southern industry for years. From 1914 to 1926 he served as president of the West Virginia Light & Traction Company. During 1916 and 1917 he was vice-president of the Anniston Ordnance Company, affiliated with the Anniston Steel Corporation. Today he is president of the corporation that bears his name and of its various subsidiaries. In addition he is a director of the First National Bank of Anniston, Ala.; First National Bank of Birmingham, Ala., and Bankers' Mortgage Company, also of that city.

J. F. Pollard Named General Manager of Seattle Utility

JAMES F. POLLARD, manager of the Coast Valleys Division of the Pacific Gas & Electric Company, with headquarters at Salinas, Calif., has resigned to assume the duties of general manager

of the Seattle Lighting Corporation, newly acquired subsidiary of the Central Public Service Corporation with headquarters in Chicago.

During his career Mr. Pollard has distinguished himself as an executive of rare ability. He is long experienced in public utility work. Upon graduation from the University of California in 1912 with the degree of bachelor of engineering he joined the engineering department of the Pacific Gas & Electric Company and from then until 1915 most of his time was spent on the Drum development. In that year he became assistant engineer of the California Railroad Commission. Then in 1918 he was appointed commercial manager of the Sierra & San Francisco Power Company and the Coast Valleys Gas & Electric Company and assistant to Capt. H. F. Jackson, who then was president of both companies.

In 1920 Mr. Pollard was appointed vice-president in charge of operation of the Coast Valleys company, and when the Byllesby interests of Chicago acquired control of the company Mr. Pol-

lard was made vice-president and general manager.

Mr. Pollard for several years has been active in the work of the Pacific Coast Electrical Association, and last year served as chairman of the commercial section. He is still a member of the executive committee of that section and of the advertising-publicity section.

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A. N. Cartwright Elected to Vice-Presidency

A. N. CARTWRIGHT, general superintendent of operations of the West Penn Power Company, Pittsburgh, has been promoted to operating vice-president in

charge of all maintenance and engineering having to do with generation, transmission and distribution. Mr. Cartwright has been with West Penn since July, 1903, having charge during this time of various engineering and construction activities.

Previous to his connection with West Penn, Mr. Cartwright was with the Lonaconing Electric Light Company, Lonaconing, Md., from 1898 to 1900; the Consolidated Coal Company, Ocean, Md., 1900 to 1901; Camden Interstate Railways Company, Ashland, Ky., 1901 to 1902, and from 1902 to 1903 with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

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J. A. CORCORAN, prominently identified with the electrical manufacturing and jobbing business, has been appointed director of development of the Electrical Association of New York, Inc. Mr. Corcoran, who has many years' experience in the creation and operation of co-operative campaigns, will co-ordinate the work of the five promotion committees of that association. Some few years ago he was connected with the General Electric Company in Schenectady and Bridgeport, where he made a special study of retail electrical merchandising. More recently he served as New York manager of the Kelvinator Sales Corporation.

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HENRY L. DOHERTY, president of the Cities Service Company, returned from Mediterranean ports on the Cosulich Line motorship *Vulcania* January 21.

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OBITUARY

GEORGE HENDRICKS HIGGINS, a director and manager of the Cortland Forging Division of the Brewer-Titchener Corporation, Cortland, N. Y., died December 26.

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DR. FRITZ BLAU of the Osram Gesellschaft, died in Berlin December 5 at the age of 64. Dr. Blau was a leading German authority on electric lamps and was well known for his work in connection with the development of the gas-filled metal-filament lamp.

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HOWARD W. LEE of the Public Service Company of Northern Illinois died January 8 in Phoenix, Ariz., where he had been sent several months ago by his company to regain his health. Mr. Lee had been with the Public Service Company for about ten years, his last position being that of superintendent of the Maywood-Elmhurst district. He was born February 21, 1887, in South Bend, Ind., and was a graduate of Purdue University.

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WILLIAM JAMES A. LONDON, works manager of the Reider-Ericsson Company, Walden, N. Y., died suddenly of apoplexy on November 14 at his home in that city. An Englishman by birth, Mr. London was associated with C. A. Parsons & Company, Newcastle-on-Tyne; Brown, Boveri & Company of Baden, Switzerland, and the British Westinghouse Company at Trafford Park, near Manchester, giving special attention in these connections to steam turbine developments. In 1906 George Westinghouse, being impressed with Mr. London's versatility as a designer, had him transferred to the East Pittsburgh Works of the Westinghouse Machine Company, where he carried out some special experimental work. Subsequently he affiliated himself with the Terry Steam Turbine Company, Hartford, Conn.; Sterling Blower Company, and the General Electric Company at Lynn, Mass. In 1916 he organized the Steam Motors Company with offices at Springfield, Mass., and a plant at Chicopee Falls, Mass., and later he organized the London Steam Turbine Company. Mr. London established consulting engineering relations with the Combustion Engineering Company. In 1927 he became associated with the Peabody Engineering Company and undertook some important development in coal pulverization at the works of the Reider-Ericsson Company in Walden and at the conclusion of these tests in January, 1929, he became works manager. Mr. London was a prolific patentee and author of numerous articles on steam turbine design and coal pulverization.

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WILLIAM F. DETERT, at one time president of the Northern California Power Company, which later became part of the Pacific Gas & Electric Company, died in San Francisco December 13, at the age of 79. He had been identified with mining for many years in California and at the time of his death was associated with many prominent mining, banking and other business enterprises.

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WARREN D. KING, general manager of the Peabody (Mass.) Municipal Electric Light Department, died January 5 at the Thomas Hospital from injuries sustained in an automobile accident in September. Mr. King, a graduate of the Massachusetts Institute of Technology, was born in Peabody, August 1, 1870. Early in life he was engineer with several construction companies and later entered the city service as supervising engineer at Peabody. Since 1912 Mr. King had been manager of the Municipal Electric Light Department. He was a member of the State Municipal Lighting Association for 23 years and for the past nineteen years.

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FRANK MISTERSKY, who was general superintendent of the Public Lighting Commission of Detroit for twenty years, died of pneumonia at his home in that city January 6. Mr. Mistersky was born in West Prussia, Germany, 66 years ago. At first his family settled in Pennsylvania upon arriving in this country, but subsequently removed to Detroit, where Mr. Mistersky first became interested in electrical work. It was in 1902 that he was appointed to the position of chief operating electrician, in 1904 he became assistant superintendent of the city lighting commission and seven years later he was named superintendent.

Financial and Statistical News

BOND AND DEBENTURE issues continue to make their appearance and a substantial number of utility issues will come forward in the near future, according to present plans. A $20,000,000 issue was sold with a 4½ per cent coupon this week.

——TRADING CONTINUED SOMEWHAT DULL in the general market and utility securities were no exception to the rule, though midweek a firmer tone became apparent and continued for a few days.

General Public Service Adds 2,341,302 to Surplus

GENERAL PUBLIC SERVICE CORPORATION reports for the year ended December 31 net earnings of $3,385,890, the largest of any year in its history. The earned surplus stood at $4,120,316 at the end of the year, an increase of $2,341,302 over 1928, with $456,482 cash on hand. Interesting comment on the effect on the corporation of the market break in October and November is made in the annual report to stockholders by C. W. Kellogg, chairman of the board, who says: "At its highest point, on September 23, the market value of your corporation's assets was 94 per cent above their cost or book value. At its lowest point, on November 13, the market value was 11 per cent below their cost or book value. As of December 31, the market value was 19 per cent above cost or book value."

The asset value of the common stock on December 31 was $27.97 per share, which was 46.2 per cent more than the book value of the equity in the assets which it represents. Semi-annual dividends of 3 per cent were paid and stock dividends paid during the year were capitalized out of earned surplus at $10 per share. There were 4,897 stockholders at the end of 1929.

Commission Forbids Bond Discount Capitalization

BY REFUSING to approve an application from the Central Maine Power Company for permission to issue $791,386 in capital stock to meet unamortized interest on bond discounts the Maine Public Utilities Commission has added an important decision to those which have been made by other regulatory bodies.

In a 36-page review of the petition, the commission says: "The capitalization of bond discount encourages the practice of selling bonds at prices below the true value for profit-taking purposes. The days of overcapitalization are not so far behind us as to permit us to forget the evil effects that followed the unrestricted floating of securities."

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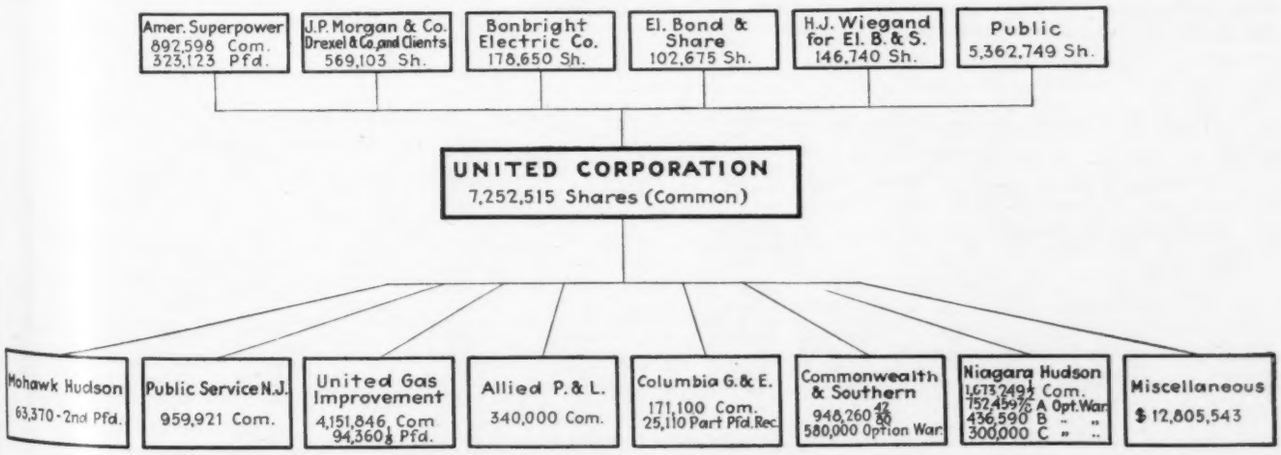
United Corporation Assets Double During Year

THE readjustment of lines of control in and the increasing attention paid by banking interests to the utility picture in the United States are remarkably well illustrated by the set-up of United Corporation. The ownership of this one-year-old organization and the minority interests it has segregated in its portfolio are indicated graphically below and need no further discussion.

It will be recalled that United Corporation was launched in January, 1929, by J. P. Morgan & Company, Drexel & Company and Bonbright & Company, Inc. Although commencing with assets of $150,000,000, its first birthday showed



more than double this, or $323,307,177. Despite the market break the young corporation showed a gain of almost ten millions in security holdings at the end of 1929. This gave common stock an asset value of $32.33 per share. Earnings were at the rate of about 80 cents.

The corporation's statement as of December 31 shows a balance of $3,555,676 carried to surplus. This amounts to approximately 40 per cent of income after $4,741,053 dividends on $3 preference stock and is the equivalent of about 1 per cent on investment. This figure does not include stock dividends worth over $500,000.

The corporation's portfolio at the end of the year showed no new acquisitions of stocks since June 29 except through stock dividends, stock split-ups, exercise of rights and exchange of certain securities. The 754,881 shares of United Gas Improvement owned on June 29 were split into 3,774,405 common shares and 94,360 preferred shares, and rights to acquire 377,441 additional common shares were exercised, making 4,151,846 United Gas Improvement common shares now owned. Similar changes are shown in Commonwealth & Southern and Columbia Gas & Electric holdings.

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NEWS BRIEFS

Power & Rail Trusteed Shares, an investment trust designed to buy utility and railroad securities, is launched.

Stockholders of Insull Utility Investments, Inc., authorized increase in common stock from 3,000,000 to 6,000,000 shares.

Detroit Edison Company reports an 8 per cent increase in gross, a 10.1 per cent increase in output and a 4 per cent growth in net income in 1929.

Community Power & Light Company, St. Louis, declared a 75 cent cash dividend on common as well as its preferred dividends.

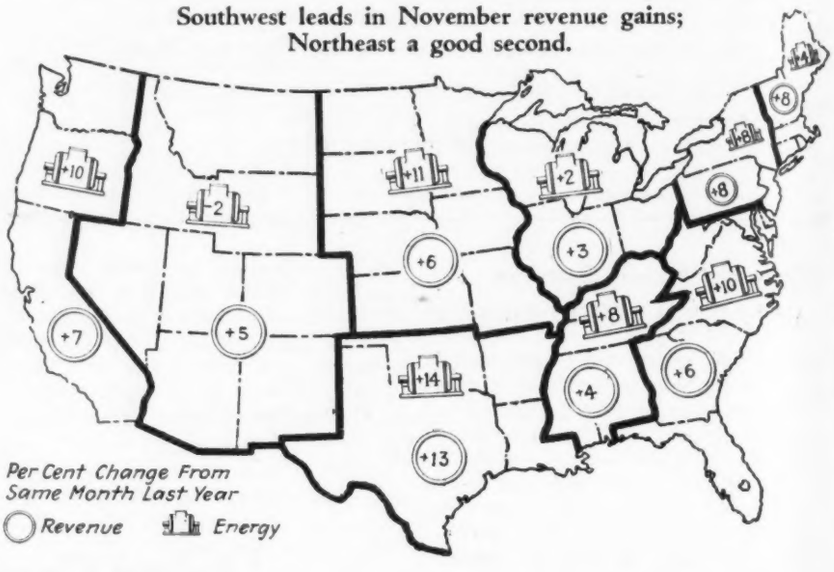
November Light and Power Revenue $186,400,000

THE November revenue of the electric light and power companies in the United States, computed on the basis of reports received by the ELECTRICAL WORLD to amount to $186,400,000, is the largest ever attained by the industry for any month, exceeding that of last January, the previous highest month, by fully $2,000,000. It surpassed that of October by 4.5 per cent and that of last July by nearly 17 per cent. The upward movement is in accord with the usual seasonal change.

The average daily revenue, $6,210,000, also broke all records but one: The figure for last February was slightly greater. The variations since the beginning of 1928 are evident from the chart.

In comparison with the corresponding revenue in 1928, November shows a smaller rise than any other month of 1929. In this respect there has been a perceptible falling off: August stood 10.2 per cent higher in 1929 than in 1928, November only 6.7 per cent, with a gradual change during the intervening months. It should be noted, though, that the revenue is still above the projected line of growth based on the past five years.

Southwest leads in November revenue gains; Northeast a good second.



The energy output, 7,880,866,000 kw.-hr., exceeded by about 7 per cent that of November, 1928, which may be compared with 13 per cent for July, 12 for August, 11 for September and about 10 per cent for October.

On each of these counts, then, it appears that, whatever may have happened in other individual industries, electric light and power operations for November did not suffer a general recession. The most that can be said is that there was less than the usual increase; any

Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1929 Thousands	1928 Thousands	Per Cent Inc.	1929 Thousands	1928 Thousands	Per Cent Inc.
August	$163,400	$148,600	+10.2	$72,700	$66,600	+ 9.1
September	170,100	156,100	+ 9.0	72,400	65,750	+10.1
October	178,400	164,900	+ 8.2	77,000	69,900	+10.1
November	186,400	174,800	+ 6.7	74,850	69,200	+ 8.2

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1929	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
August	3,648,175	+15.9	760,996	+29.1	10,317,672	+34.8
September	3,628,818	+13.6	787,650	+33.7	11,160,817	+53.6
October	3,768,647	+ 7.0	1,045,937	+76.0	12,396,196	+59.4
November	3,505,746	+ 1.9	1,153,734	+93.5	11,408,164	+53.7

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1929	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
August	7,963,547	+11.7	2,732,956	— 7.3	5,230,591	+25.2	1,630,000	+ 8.2
September	7,681,149	+10.9	2,372,617	—12.5	5,308,532	+26.0	1,708,000	+14.0
October	8,317,489	+10.2	2,643,848	— 5.4	5,673,641	+19.3	1,776,000	+17.6
November	7,880,866	+ 6.8	2,579,911	— 5.1	5,300,955	+13.8	1,683,000	+13.6

Table IV—Regional Operations, Revenue and Energy Output in November, 1929

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	186,400	+ 6.7	7,880,866	+ 6.8	2,579,911	— 5.1	5,300,955	+13.8
New England	18,790	+ 8.1	525,183	+ 4.4	126,186	—29.7	398,997	+23.4
Middle Atlantic	49,850	+ 7.9	1,961,697	+ 7.9	539,014	+12.7	1,422,683	+ 6.2
East North Central	45,600	+ 3.1	1,912,456	+ 2.2	191,400	—16.8	1,721,056	+ 4.9
West North Central	15,580	+ 6.3	469,487	+11.1	107,701	—17.3	361,786	+23.8
South Atlantic	19,640	+ 5.7	1,009,044	+ 9.9	596,872	+26.9	412,172	— 8.5
East South Central	6,460	+ 3.9	288,449	+ 8.2	221,953	+ 2.8	66,496	+31.1
West South Central	9,940	+13.4	421,653	+14.4	5,869	+334.0	415,784	+13.2
Mountain	4,700	+ 4.5	300,064	— 1.6	244,201	— 7.1	55,863	+32.8
Pacific	15,840	+ 7.3	992,833	+ 9.5	546,715	—27.1	446,118	+184.0

*As collected by U. S. Geological Survey.

actual set-backs were purely local, and not serious.

Energy from water power continued low; the total was less than in October, though the average daily was about the same as in that month; it was also smaller than in November, 1928, and constituted less than 33 per cent of the entire output. Energy from fuel, on the contrary, overshot the corresponding output in 1928 by nearly 14 per cent.

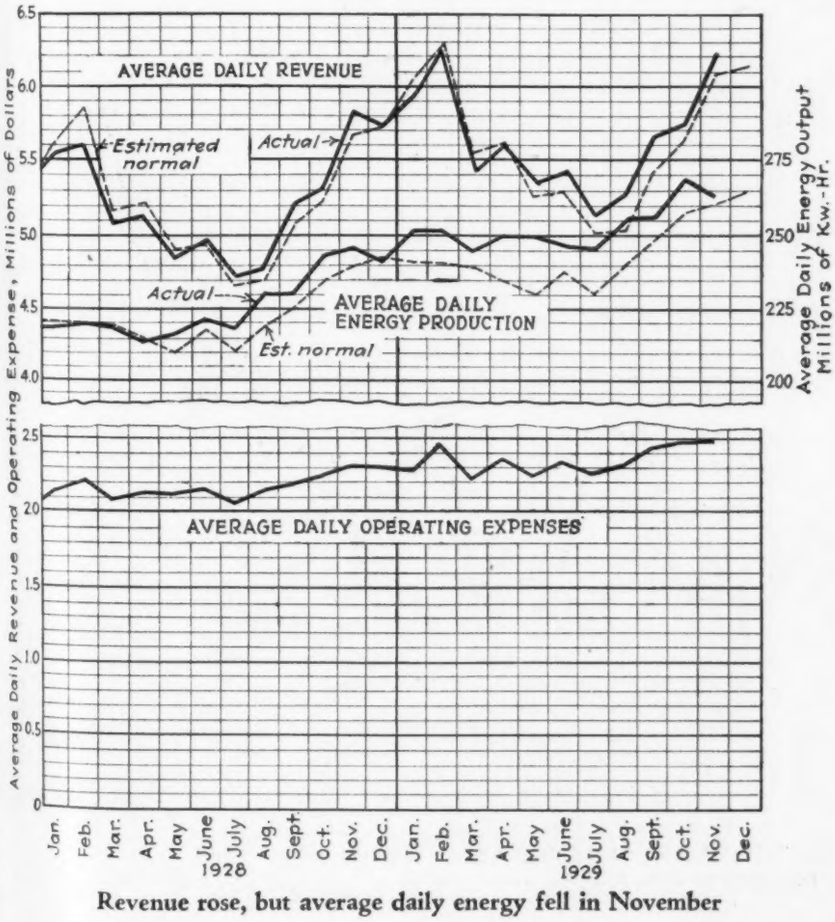
Regionally the gain in revenue was less in the Great Lakes and eastern Mississippi Valley States than elsewhere, as appears from Table IV and the map. The Southwest again outranks the rest of the country in rate of increase; in fact, the gain here (13 per cent) was better than in October.

As to energy production, the rate of increase compared with November, 1928, was greatest in the West South Central States (14 per cent), but was only 2 per cent in the East North Central, 4 per cent in New England and 8 per cent in the Middle Atlantic States.

Scarcity of water was most serious on the Coast, where a normal increase in total output with a decrease of 20 per cent in the amount available from water raised the output of thermal plants by 184 per cent—from 157,155,000 kw.-hr. in November, 1928, to 446,118,000 kw.-hr. in November, 1929.

Fuel consumption, as appears from Table II, in general moved with changes in output of steam plants. The growing use of natural gas and oil fuel is to be noted.

The present financial statistics are comparable with monthly figures heretofore published. It is found, however, that for a considerable time the revenue has been slightly underestimated. In the yearly figures appearing in the ELECTRICAL WORLD of January 4, 1930, a suitable correction has therefore been applied.



Revenue rose, but average daily energy fell in November

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NEW CAPITAL ISSUES

GOLD DEBENTURES TO THE AMOUNT of $25,000,000 were offered by the New England Power Association at 95 and interest, yielding 5.88 per cent. These debentures, dated December 1, 1929, will mature December 1, 1954. Proceeds will be used for the retirement of short-term loans, for part of the construction program at Fifteen-Mile Falls development on the Connecticut River, for other construction, additions and extensions and other company purposes.

First and refunding mortgage gold bonds of the Public Service Electric & Gas Company to the amount of $20,000,000 have been offered at 95½ and interest, to yield 4.75 per cent. Proceeds will be used to reimburse the company in part for expenditures made and to be made for additions and improvements to the properties.

A Canadian issue appeared among the week's new offerings—a ten-million-dollar issue of 6 per cent first mortgage sinking fund convertible gold bonds, series A, of the Northwestern Power Company, Ltd. These bonds were priced at 98 and interest to yield 6.14 per cent.

Business News and Market Conditions

Seasonal Decrease in Manufacturing

REPORTS received by the ELECTRICAL WORLD from a large proportion of the electrical manufacturing companies indicate that December witnessed a decrease in rate of operations as compared with November of about normal proportions. Every December for the past five years has witnessed a rate of operations under those of November. The December rate of operations was 7.4 per cent under November, but was still 16 per cent above that reported for December, 1928.

The average rate of activity by these electrical manufacturing plants for the year 1929 as a whole was 25.4 per cent above that reported for 1928. Practically every type of electrical manufacturing plant shared in this large gain.

The reports on electrical energy consumption indicate that the large manufacturing companies are holding up very much better than the smaller companies. The group of larger manufacturers recorded a rate of operations during December of about the same proportions as during November but on a plane about 28 per cent over December, 1928. The group of smaller manufacturing plants recorded a decrease of 11.2 per cent as compared with November and were operating at a rate 3.6 per cent over December, 1928.

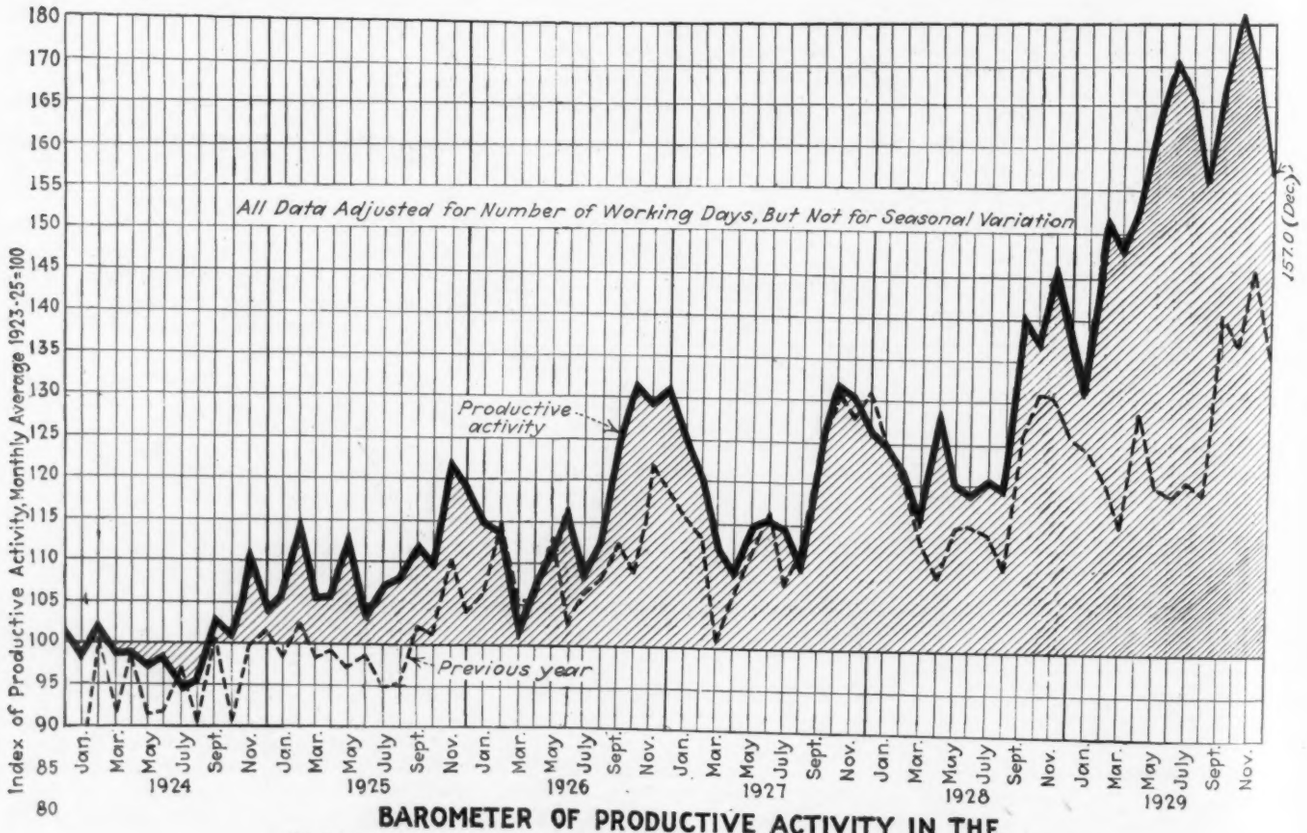
The index of activity in the electrical manufacturing industry based on consumption of electrical energy stands at 157 for December as compared with 135.3 in December, 1928. Comparative indexes of productive activity for the period 1923-25 as 100 and adjusted for number of working days are as follows:

December, 1929	157.0
November, 1929	169.5
October, 1929	180.6
September, 1929	168.8
December, 1928	135.3
Average, 1929	159.8
Average, 1928	127.4

Howell Electric Purchases Jeannin Electric Company

DIRECTORS OF THE Howell Electric Motors Company, Howell, Mich., announce the purchase of the business of the Jeannin Electric Company of Toledo, Ohio. The Jeannin Electric Company manufactures a line of single-phase and direct-current motors and has been in business since 1918. The manufacturing equipment and business of the Jeannin Electric Company will be moved to the Howell plant.

This purchase includes all assets and good will of the Jeannin Electric Company, with the exception of accounts and bills receivable. The Jeannin Electric Company will liquidate its own liabilities and discontinue business. The purchase was made for cash and without change in the corporate structure of the Howell organization. W. M. Spencer is president of the Howell Electric Motors and Charles Norton is vice-president and general manager.



BAROMETER OF PRODUCTIVE ACTIVITY IN THE ELECTRICAL MANUFACTURING PLANTS OF THE UNITED STATES

Are Marketing Costs Too High?

WHETHER or not there is a serious lack of detailed data on cost of distribution in the electrical industry was one of the questions discussed before the midwinter meeting of the National Electric Manufacturers' Association. The discussion was led by Thomas W. Howard, recently appointed director of uniform accounting for the association. Mr. Howard opened his remarks by summarizing a few of the objectives as follows:

(a) To effect economies in individual items of marketing cost, such as advertising and salesmen's expenses. Such control is brought about through the use of a budget.

(b) To establish sales prices (or effect control of profits) through a knowledge of marketing costs of individual products.

(c) To supervise the profitableness of sales methods, sales territories, and possibly of individual salesmen.

"In every industry with which I have had contact," said Mr. Howard, "and especially those with which I have worked on production cost accounting during the seven years I have been identified with this work in the National Chamber of Commerce, there have been charges of price cutting in the industry. It is a common complaint. Some of these charges, I know, are due to inaccuracy of statement as to prices that were actually quoted. In other words, there was no substantial basis for the assertion that there had been unethical cutting of prices. In some cases the presumption of price cutting was caused by a comparison of prices on articles or products that were not identical in character. Then, of course, there are those cases of the cutting of prices wilfully and in the belief that such practice is sound policy in the conduct of business. Finally, there are those cases of erratic price quotation by those who may think they know their costs but actually do not.

"It is not easy to differentiate between these several groups, but I am convinced that a lack of knowledge of costs is a frequent cause of the quotation of prices that are upsetting to the competitive situation.

"Right-thinking executives wish to eliminate every practice that is detrimental to the conduct of business by the best ethical standards. But these business executives and their associates must be provided with accounting and budgeting systems and those other aids to management that will enable them to employ their native intelligence and ability to the best advantage. It is no longer a day when judgments are made simply by intuition and without exact knowledge of underlying conditions.

"I can simply say, in closing, that in my opinion every industry in this country can with profit undertake the cooperative or mutual study not only of production cost accounting but also of the cost problems found in the marketing of products."

The current state of business and industry was carefully studied and papers were presented by Clarence L. Collens, president of the association, and Dr. Virgil Jordan, economist of *Business Week*. These and the general meetings are discussed elsewhere in this issue.

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Edison Lamp Works Moves to Cleveland

ON OR ABOUT MARCH 1 the Edison Lamp Works of the General Electric Company will be established in its new and larger quarters at Nela Park, Cleveland, Ohio. Nela Park, for several years, has been the headquarters of the administrative, manufacturing and research departments of the incandescent lamp department of the General Electric Company.

The proposal of the R.C.A. Radiotron Company to purchase the Harrison property was accepted by the Edison Lamp Works, since the proposition made possible the long-desired move to Cleveland. E. E. Potter is the new general sales manager and P. D. Parker and H. F. Barnes have been named assistant sales managers.

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Zinc Features Metal Market

ACTIVITY IN ZINC was easily the feature in the market for non-ferrous metals last week, the tonnage sold being the largest in many months. Lead sales were above the average and interest in copper ran high.

	Jan. 15, 1930 Cents per Pound	Jan. 22 1930 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	6.25	6.25
Antimony	8½	8¾
Nickel, ingot	35	35
Zinc, spots	5.50	5.50
Tin, straits	38¼	38¼
Aluminum, 99 per cent	24.30	24.30

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Market Conditions

DEFINITE REVIVAL in heavy equipment has taken place in the Eastern district. Central station business is more active than for some time and industrial demand promises to show recovery in the near future.

——NEW ENGLAND AND THE SOUTHEAST report a revival of interest in the industrial field. Central station orders are small.

——EQUIPMENT ORDERS ARE SUBSTANTIAL on the Pacific Coast. Central stations are promoting construction and extensions actively.

SOUTHWEST

—SEVERE WEATHER CONDITIONS *have reduced the volume of building construction materials moved to a very low point.*

—POWER COMPANIES *are buying in good quantity and merchandise, especially heating and cooking devices, are in good demand.*

A Portland cement company bought seventeen panels of switchboard, costing about $12,000, to take care of additions to plant. Five synchronous motors to cost $25,000 were ordered for a municipal waterworks. A contract was placed by a distributing company in the western part of this district for six power transformers, 1,000-kva. each, with switching equipment, for outdoor substation, all to cost $30,000.

CONSTRUCTION PROJECTS

Baumes-McDevitt Company, St. Louis, Mo., plans power plant at factory to cost $150,000 with equipment. Eagle Motor Truck Company, St. Louis, Mo., plans plant to cost close to $100,000 with equipment. New Madrid, Mo., plans extensions and improvements in municipal electric light and power plant, including installation of additional equipment. Missouri Utilities Company, St. Louis, Mo., plans ornamental lighting system at Eldon, Mo. Arkansas Power & Light Company, Pine

Bluff, Ark., is perfecting plans for hydro-electric power development on Ouachita River, near Hot Springs, Ark., reported to cost over $750,000. Texas Power & Light Company, Dallas, Tex., will soon begin construction of an addition to power plant at Trinidad, Tex., to cost more than $1,000,000. Magnolia Petroleum Company, Dallas, Tex., has superstructure under way for power plant at refinery at Beaumont, Tex., to cost more than $150,000.

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EASTERN

—ENCOURAGING FACTORS CONTINUE *in the electrical equipment market in the Eastern district and there is an optimistic tone to the situation.*

—CENTRAL-STATION BUSINESS *continues to lead in volume of orders, as well as inquiries; with the placing of commitments for turbo-generator units by Eastern power companies, heavy machinery account shows pronounced revival.*

—ELECTRIC RAILWAY SALES *hold on a good basis, with electric locomotives recording additional orders. Industrial demand gives immediate promise.*

Central stations definitely are in the market. A New York manufacturer has secured an order from a utility company in the northern part of the state for a turbo-generator and accessories to cost $1,000,000, and another contract from a Connecticut power company for a smaller such unit to cost about $400,000. A Pennsylvania maker will furnish a 15,000-kw. turbo-generator, with condenser and auxiliaries, for an installation in Oklahoma, the order for two 1,000-hp. boiler units going to a New York manufacturer. A power company in North Carolina has given a contract to a New York maker for switchgear, transformers and accessory equipment to cost $115,000, while a central station in Texas has placed an order with the same manufacturer for like apparatus to the amount of $475,000. A municipal power plant in Louisiana has ordered a Diesel engine unit from a St. Louis manufacturer. A metropolitan power interest has purchased a quantity of switchgear and miscellaneous parts to cost $30,000.

Contracts for three electric locomotives have been placed with a Pennsylvania manufacturer, all to be used for industrial service. The Great Lakes Steel Company, Michigan, will take two of the units, rated at 300 hp., 70-ton capacity, while the other will be used by the American Steel & Wire Company at its Cleveland works. The New York Central Railroad Company has purchased a quantity of insulation materials from a state manufacturer, to cost $50,000, while a metropolitan street railway system has contracted for truck mechanisms with the same maker, to an amount of $40,000. The Pennsylvania Railroad Company has given an order to the Union Switch & Signal Company for signal devices and equipment for lines between Altoona and Pittsburgh, to cost $400,000.

A manufacturer of motors states that current demand is fair, with larger account destined to mature within 30 to 60 days; spring trade is expected to reach record proportions. Another maker of industrial motors and controls says that inquiries exceed orders and that future trend is problematical. A manufacturer of electric refrigerators is running on a capacity schedule at his plant in the Middle West and reports a pronounced upward swing in orders; the first two weeks of the year show new high sales record. The demand for airport lighting equipment is increasing and there is some sizable business maturing in that line. Similarly, street-lighting apparatus shows good promise.

CONSTRUCTION PROJECTS

Signal Supply Officer, New York General Depot, Brooklyn, N. Y., will receive bids until February 4 for motor-generators in lots of 10 to 125 (Circular 76). The New York Hospital, Cornell Medical Association, will build a four-story power plant, mechanical laundry and garage at proposed institutional building, entire project to cost over $1,500,000. New York Power & Light Corporation, Albany, N. Y., has plans for an equipment storage and distributing plant, and office, estimated to cost $300,000. Buffalo General Electric Company, Buffalo, N. Y., has filed plans for two power substations to cost about $50,000. "Buffalo Courier-Express," Buffalo, N. Y., will build a printing and publishing plant to cost $450,000. Niagara Falls, N. Y., contemplates an addition to cost more than $70,000. Liquid Carbonic Company, Chicago, Ill., will carry out expansion program at carbonated beverage equipment manufacturing plants at New York and vicinity, estimated to cost more than $300,000. Robert Gair Company, New York, plans addition to corrugated board plant at Piedmont, N. Y., to cost over $100,000. Board of Education, Newark, N. J., is asking bids until January 30 for Fawcett School of Industrial Arts, reported to cost over $300,000. Bakelite Corporation, New York, will soon take bids for plant at Bound Brook, N. J., to cost more than $150,000. State Board of Education, Trenton, N. J., will soon take bids for a power plant to cost $100,000. Alan Wood Mining Company, operated by Alan Wood Iron & Steel Company, Conshohocken, Pa., will begin work on extensions and improvements in iron ore plant at Oxford, N. J., to cost $150,000. E. I. du Pont de Nemours & Company, Wilmington, Del., will build two additions to paint plant at Philadelphia, Pa., to cost $125,000. Shell Eastern Petroleum Products, Inc., New York, has filed plans for a storage and distributing plant at Philadelphia, Pa., to cost $100,000. General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until February 4 for flashlights, 21 electric motors, etc. (Panama Schedule No. 2523). Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until February 4 for ten electric heaters and spares for the Mare Island navy yard (Schedule 2646).

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PACIFIC COAST

—TRANSFORMER ORDERS CONTINUE *to feature coast business. Contractors report many large jobs for figuring and much store remodeling.*

—RADIO BUSINESS *has been affected by rumors of sharp drop.*

—CREDIT CONDITIONS *are good. Fears of acute water shortage are dispelled by statewide rains, passing from north to south.*

Westinghouse reports a $225,000 sale of transformers for southern California and a $15,000 sale for Salt Lake City. General Electric reports four size 4,000-kva., value $70,000, for a northern California installation. Other orders include $6,000 worth of General Electric indicating selsyns for synchronized motor control, $30,000 condensers for Seattle, $13,000 condensers for a Puget Sound lumber firm, $60,000 elevator control motors and equipment for Los Angeles, and $12,000 tank lifter and switching equipment for Seattle. Other power purchasing is light, covering only such items as two carloads fiber conduit and three carloads poles. Range sales to jobbers are good, Westinghouse reporting two carloads for Seattle and one carload for Los Angeles. Pacific Gas & Electric campaign for first quarter of year has scheduled heater sales of 4,200. This company has also staged a campaign to improve lighting standards. Street-lighting business has improved and includes projects for Oakland, Whittier, Winters, Glendale, San Leandro, Santa Cruz, a $20,000 job for Hanford and 306 standards for Los Angeles. New power construction announced covers a 4,000-kva. plant for Merced Falls, a $3,500,000 steam plant for Fresno to be fired by natural gas, a $1,500,000 substation for Hayward to serve packing and industrial plants, and $40,000 system betterments to serve Russian River summer resorts.

A bill authorizing the issuance of $10,000,000 in bonds to provide for extensions to the city of Seattle's lighting and power system has been introduced in the City Council, the proposed extensions involving an addition to the Lake Union steam generating plant, acquirement of substations and extensions thereto, and extending the present distribution system. Tentative specifications are being written and a bid call will be issued by the city of Seattle within two months for about $500,000 worth of oil circuit breakers to be installed in the hydro-electric plant to be

constructed below Diablo Dam, for which bids are now being taken for machinery and equipment. Twelve or more breakers will be purchased. The Fairbanks-Morse Company has secured the contract for furnishing in excess of one hundred motors, ranging from 150-hp. down, to the Puget Sound Pulp & Timber Company at Everett, Wash. Specifications are expected to be issued shortly by this company for about 30 pumps, ranging from 12-in. down for installation in the plant. Other motor awards reported include about $3,000 worth to an Oregon fruit cannery, fifteen from 200-hp. down to a sawmill, and ten from 150-hp. down to a woodworking plant in the Puget Sound district. About $5,000 worth of miscellaneous switching equipment was reported sold during the week.

CONSTRUCTION PROJECTS

Burlingame, Calif., contemplates the installation of a municipal electric light and power system. Southern Sierras Power Company, Riverside, Calif., plans extensions and improvements in power substations and system in Imperial Valley section to cost $140,000. Pacific Gas & Electric Company, San Francisco, Calif., will make extensions and improvements in power substation and transmission lines at Newark, Calif. Wasco Creamery Company, Bakersfield, Calif., plans milk products plant to cost $140,000. Master Service Company, Los Angeles, Calif., plans automobile service and garage building to cost about $120,000. Los Angeles Gas & Electric Company, Los Angeles, Calif., plans power substation to cost about $80,000. Wheeler-Osgood Company, Tacoma, Wash., plans sash and door mill at Los Angeles, Calif., to cost $100,000. Tacoma, Wash., will soon ask bids for equipment for a steam-operated electric power plant on Taylor Way, 25,000 kw. capacity, estimated to cost $200,000. Wyoming Carbonizing & Briquetting Company, Kemmerer, Wyo., plans coal briquette plant to cost $250,000.

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SOUTHEAST

—THE GENERAL TREND OF BUSINESS *in the Southeast is satisfactory and the volume of orders is well sustained. A power company in South Carolina ordered $10,000 worth of carrier-current equipment and a Georgia company ordered $7,000 of control equipment for installation in a steam plant under construction.*

One company's small switch orders last week totaled $5,500, while its distribution and small power transformer purchases amounted to $5,400. One central station order received last week was for $4,600 of house type meters and another was for $3,200 of conduit. One of the smaller Georgia companies ordered $3,000 of Z.M.A. poles. The industrial situation is reported improved over last week, though no orders of outstanding size were placed. A coal and iron plant in Alabama was responsible for a $10,000 motor order. An electrification contract was let on a cotton mill in northeast Georgia which will involve $8,000 in apparatus to be purchased by the mill and a 600-kva. substation to be purchased by the power company.

CONSTRUCTION PROJECTS

Appalachian Electric Power Company, Roanoke, Va., will proceed with superstructure for an addition to power plant at Glen Lyn, Va. Tennessee Stove Works, Inc., Chattanooga, Tenn., will build an addition to cost about $175,000. Tennessee Public Service Company, Knoxville, Tenn., plans transmission line from Waterville, N. C., to Knoxville, about 50 miles. Wilson, N. C., has approved plans for extensions and improvements in municipal electric light and power plant to double capacity. Mississippi Power Company, Gulfport, Miss., plans power substation at Wathal, Miss., to cost about $30,000. Florida Power Corporation, St. Petersburg, Fla., will make extensions and improvements in street-lighting system at Dunellon, Fla. Daytona Beach, Fla., contemplates installation of floodlighting system and beacon lamps at proposed municipal airport.

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NEW ENGLAND

—INDUSTRIAL EQUIPMENT *is attracting interest and inquiries concerning large power units are increasing in number. There is an encouraging activity among turbo-generator divisions.*

—CENTRAL-STATION SUPPLIES *are moving in small lots. A number of outside switch and control equipment sales were reported for the last week; small motor sales are increasing and scheduled materials are maintaining a steady trend.*

Among the special electrical equipment now showing strength should be noted a good demand for arc welders, a number of which have been recently ordered for this district. According to one manufacturer's representative, interest at this time in this apparatus is stronger than last year. A 2½-ton industrial electric truck was ordered for a prominent electric light company. New England industrial expansion is noted in many plant additions and added power requirements, many of which are reflected in electrical equipment orders in small lots. Merchandising to date shows a gain this month over last year, and radio sales are being maintained in good volume. Cleaners and irons are moving well.

CONSTRUCTION PROJECTS

Central Maine Power Company, Augusta, Me., will soon begin superstructure for hydro-electric power plant on Kennebec River, near Bingham, Me., reported to cost close to $5,000,000, with transmission lines. Hain Brothers, Inc., Norwalk, Conn., will build an ice-manufacturing plant to cost about $27,000.

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MIDDLE WEST

—A SLIGHT ACCELERATION *in general business was noticeable this week in the Middle West section. Reports eminating from the steel industry indicate improvement, while resumption of production in the automotive field is looked upon as a favorable indication.*

—RAILROADS HAVE PURCHASED *a considerable amount of rolling stock with a substantial amount of rails and equipment.*

—INDUSTRIAL ACTIVITY *is somewhat spotty, although some improvement is looked for toward the close of the month.*

Some of the interesting orders placed this week include circuit breaker equipment valued at $500,000, two hundred 25-kva. 100 75-kva. and 100 100-kva., single-phase pole type distribution transformers, construction of substation to cost $85,000, 180 2,000-amp., 15-kv., single-pole, single-throw lock bolt type disconnecting switches and 400 Thompson meters, 10 to 800 amp. capacity.

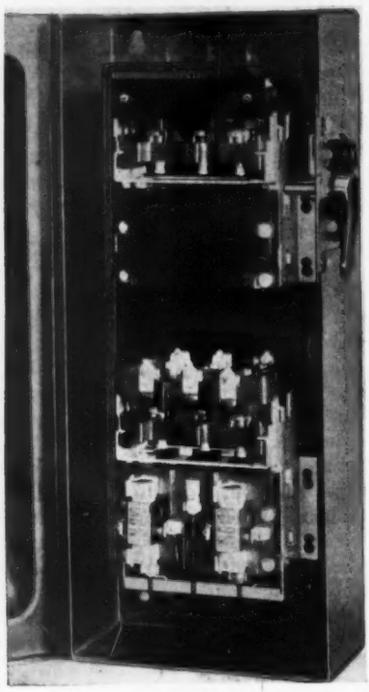
Jobbers' sales are normal. There has been a substantial amount of business received from the coal mining sections in Illinois, together with a normal amount of railroad business. Most appliances have been in steady demand, with a particularly good demand noted for electric refrigerators, vacuum cleaners and toasters.

CONSTRUCTION PROJECTS

Detroit Edison Company, Detroit, Mich., plans power substation at Algonac, Mich., reported to cost about $70,000. Commonwealth Edison Company, Chicago, Ill., plans power substation on North Dearborn Street, to cost $400,000. General Fireproofing Company, Youngstown, Ohio, plans rebuilding of portion of factory branch and distributing plant at Chicago, Ill., recently destroyed by fire with loss of about $200,000. State Welfare Department, Columbus, Ohio, plans power plant at the Longview State Hospital to cost $240,000. Lamson & Sessions Bolt Company, Cleveland, Ohio, will build an addition to plant at Birmingham, Ala., to cost more than $100,000. Marshall, Minn., will receive bids until Feb. 3 for stokers, superheaters and other power equipment for municipal station. Duluth, Minn., plans ornamental lighting system. Fairmont, Minn., has plans under way for extensions and improvements in municipal electric lighting plant to cost about $350,000. Citizens Light & Power Company, Council Bluffs, Iowa, plans extensions and improvements in power plant and system to cost about $300,000. Iowa Public Service Company, Fort Dodge, Iowa, plans extensions and improvements in power plant at Storm Lake, Iowa, reported to cost more than $50,000.

New Equipment Available

Starter Has Motor Circuit Switch



STANDARD ACROSS-THE-LINE air type alternating-current motor starters manufactured by the Condit Electrical Manufacturing Corporation may now be secured with a hand-operated motor circuit switch, as required by the National Electrical Code. For further security, beyond the requirements of the code, both the starter and motor circuit switch will open the same overload. Both are housed together in a sturdy, compact safety case which is easy to install.

The starters are furnished with or without fuse clips and meter test jacks. The meter test jacks permit the motor to be tested for load without interfering with machine operation.

The starters are furnished for motors rated up to 20 hp., 550 and 440 volts; 10 hp., 220 volts, and 5 hp., 110 volts.

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QUICK MAKE ACTION ADDED TO SWITCHES.—The design of all type C switches manufactured by the Trumbull Electric Manufacturing Company of Plainville, Conn., has been changed to give a quick positive make in addition to the quick break action regularly finished. The mechanism is different from any previous design. It has a strong compression spring, which is worked to less than 50 per cent of its maximum capacity, assuring long life, according to the manufacturer. The switch can be thrown completely on and off in case the spring should break or be removed. The design of the blade assembly also has been changed, fiber loop straps being added which attach each blade separately to the steel operating yoke. This fiber also serves as an on-position stop.

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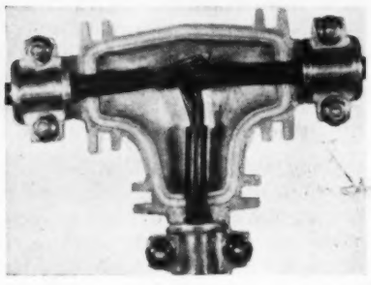
Easily Connectable Cable Joint

AN UNDERGROUND CABLE JOINT that is designed to save time in connecting parkway cables, railway signal circuits, underground cable systems, etc., is announced by the Marshall Electric Com-



pany, Elkhart, Ind. The cables may be clamped in position before the cover is fastened. The cable joint is reported to be waterproof and indestructible.

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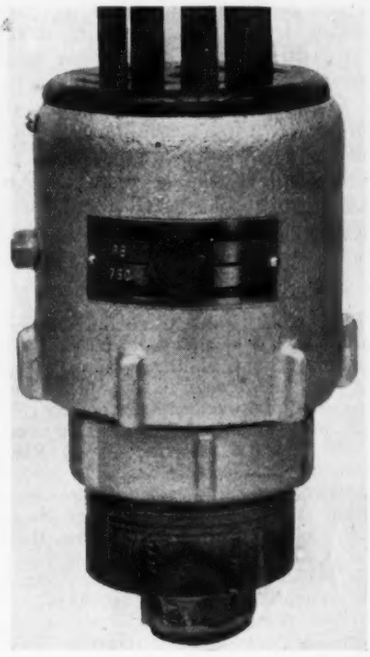
600-Volt Cable Terminal

A NEW "CABLE TERMINATOR" for sealing ends of low-voltage lead-covered cables is announced by the Delta Star Electric Company of Chicago.

The "terminator" consists of three parts—a lower adapter screwing on the conduit, a center coupling and a top insulating cover. The coupling member has an internal flanged tip which compresses the belled lead sheath between it and the bottom adapter, insuring a tight joint. The lower adapter secures an effective ground connection between the lead sheath and terminator. After filling with compound, the top insulating cover is sealed in position.

"Terminators" are made for all



standard sizes of conduits and for either single or multiple conductor cable. They can also be furnished for mounting directly on the cable without conduit.

They are not only applicable to underground construction but to installations where moisture is prevalent, such as in ice plants, pumping stations, chemical plants, oil refineries, ore bridges and outdoor cranes.

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Neon Device for Testing Circuits

A SMALL ELECTRIC TESTING INSTRUMENT called the "Test-o-lite" is announced by the L. S. Brach Manufacturing Company, Newark, N. J. The new product locates burnt-out fuses, electric light and motor trouble, faults in electric irons, vacuum cleaners and other household appliances. It is also said to be valuable in the case of electric radio sets, etc.

A small neon lamp at the top of the "Test-o-Lite" detects the trouble instantaneously. The "Test-o-lite" is not much larger than a fountain pen. It is finished in bakelite and is adapted to the testing of circuits from 100 to 550 volts alternating or direct current.